DEEP-SEA BOTTOM-FISHES

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Contents

Page

Introduction 250

Part I: Description of the Material 252

Fam. Synodontidae 252

Bathysaurus mollis GÜNTHER 252

Fam. Bathypteroidae 254

Bathypterois longipes GÜNTHER 254

Fam. Ipnopidae 257

Bathymicrops regis HJORT & KOEFOED 257

Bathytyphlops n. g. for *B. sewelli* (NORMAN) 258

Fam. Macrouridae 260

Nematonurus armatus (HECTOR) 260

Chalinura simula GOODE & BEAN 264

Chalinura leptolepis (GÜNTHER) 267

Chalinura profundicola n. sp. 268

Chalinura brevibarbis GOODE & BEAN 271

Lionurus carapinus euabyssalis n. subsp. 273

Echinomacrurus mollis ROULE 278

Fam. Brotulidae 280

Barathrites iris ZUGMAYER 282

Barathrites parri n. sp. 283

Bassozetus taenia (GÜNTHER) 284

Porogadus abyssalis n. sp. 288

Porogadus gracilis (GÜNTHER) 291

Porogadus subarmatus VAILLANT 291

Porogadus nudus VAILLANT 291

Porogadus melanocephalus (ALCOCK) 291

Porogadus trichiurus (ALCOCK) 291

Penopus microphthalmus (VAILLANT) 292

Mixonus (?)*laticeps* (GÜNTHER) 292

Parabassogigas n. g. for *P. grandis* (GÜNTHER) and *P. crassus* (VAILLANT) 298

Bassogigas pterotus (ALCOCK) 301

Bassogigas squamosus (ROULE) 301

Bassogigas profundissimus (ROULE) 301

Lamprogrammus niger ALCOCK 305

Subfam. Aphyoninae n. subfam. 308

Barathronus erikssoni n. sp. 308

Sciadonus kullenbergi n. sp. 310

Leucochlamys jonassoni n. sp. 311

Gen. et spec. indet. 313

Page

Part II: General 315
1. The composition of the deep-sea bottom-fish fauna 315
2. The bathymetrical distribution of the deep-sea bottom-fishes. The euabyssal fauna 317
3. Geographical distribution of the euabyssal bottom-fish fauna 322

References 325

Tables I—XXIII 327

In the following pages the bottom fishes obtained during the Swedish Deep-Sea Expedition will be treated. All of them, with a single exception, were taken during the trawlings carried out in the North Atlantic during the last four months of the expedition, June—Sept. 1948, when I had the opportunity to participate. The exception refers to a specimen of *Lamprogrammus*, captured in a 2 m ring-net towed with 1,500 metres of wire together with exclusively pelagic fishes and other pelagic animals in the Gulf of Panama. The *Lamprogrammus* species have hitherto been considered as true bottom fishes and because of this I have included in this treatment the description of this specimen together with the other Brotulids obtained. During our trawlings we of course got a lot of pelagic fishes caught during the hauling up of the trawl, which unfortunately cannot be closed when leaving the bottom. To decide exactly what fishes are taken at the bottom and which in the upper water layers is of course impossible, but our wide experience as to what species can be obtained in pelagic nets and what species only with gear working at the bottom gives us at least a rough idea for separating these two biological categories of fishes, between which there are, of course, no sharp or definite limits in nature. This division must consequently be an arbitrary one; the question will be discussed in more detail below. Here I have followed the general view when delimiting the material for the present publication, and have consequently treated the members obtained of the f *Synodontidae*, *Bathypteroidae*, *Ipnopidae* *rouridae* and *Brotulidae*. In this conne is worth noting, that while we got repr tives of the named families, conside bottom-fishes, in all our successful between 4,255 and 5,860 metres, not a specimen was captured at stations 3 384, at which the trawl had not quite the bottom. For further details regard trawlings I refer to my previous paper duction and Station List», No 1 in this of our Reports.

The identifying of deep-sea fishes is a very intricate task. Many of the sp brought up from great depths are in or less defective state which makes th and description of them rather c Besides this the number of specim each species is often very limited, in cases each species is only known from specimen. The range of variation with species is consequently unknown. many earlier descriptions, quite suffi the time of their publication, do not features which are of great importa later investigators, and many desc founded on defective specimens, are o very poor as to facts serviceable for id tion. Because of these circumstances very often in doubt whether a specim be identified with a previously d species or if it represents a new speci safest way is of course a direct com with type specimens. In order to v

European museums richest in deep-sea
m-fish types, the British Museum (Nat.
), London, containing the »Challenger»
tions, the Muséum National d'Histoire
relle, Paris, possessing the types of the
man» Expedition, and the Musée Océano-
ique, Monaco, where the rich material
ted by Prince Albert I^{er} de Monaco is
e found, I applied for and obtained a
lling scholarship from »Kungl. och Hvit-
ka Stipendieinrättningen», supplemented
sum from the Natural History Museum
öteborg, which enabled me to visit the
mentioned institutions in 1949, and for
ı very valuable help I wish to express
incerest thanks. I am further very much
ed to the authorities of the institutions
ioned for their permission to study the
ed material and for the friendliness with
ı it was placed at my disposal. For very
ble supplementary information about type
mens belonging to the British Museum
Hist.) I wish to express to Dr. E.
VAVAS my heartiest thanks. For the loan
pe specimens and other valuable material
ted by the Norwegian »Michael Sars»
dition I am much indebted to Prof.
BRATTSTRÖM, Director of the Zoological
um, Bergen. Very valuable specimens
mparison have also been lent out to me
the British Museum (Nat. Hist.), from
ndian Museum, Calcutta, from the Bing-
Oceanographic Laboratory, New Haven,
rom the Museum of Comparative Zoology,
ard College, Cambridge, Mass., for which
to express my great gratitude. Thanks
ıe courtesy of Dr. L. SCHULTZ, United
s National Museum, Washington, I have
ned for comparison many specimens of
es captured by the U. S. »Albatross»
ditions; regarding some type specimens
ging to this institution which could not
nt out, Dr. SCHULTZ has kindly sent me
valuable information and sketches desired
e, for which I beg to express to him my
deepest gratitude. For permission to compare our specimen of *Lamprogrammus* with one taken by the »Dana» Expeditions and to use some of the maps worked out for the publications of these expeditions I am very much indebted to Dr. Å. VEDEL TÅNING, Charlottenlund Denmark. I also have to thank the curator of the ichthyological department at the Zoological Museum of Copenhagen, Mr. J. R. PFAFF, Mag. sc., for providing opportunities to study some material in that museum.

The treatment of the bottom fishes obtained by the Swedish Deep-Sea Expedition has consequently confronted me with a rather rich material from previous deep-sea expeditions. In some cases I have arrived at conclusions differing from those of earlier authors as to the identification and systematic position of certain specimens. In other cases I have observed and noted particularities hitherto not mentioned in the literature. In the hope that these observations may be of some value to others working on deep-sea bottom-fishes, I have included them in the following pages, especially as they in many cases constitute the basis for the nomenclature employed in the lists of species given in the surveys of the bathymetrical and geographical distribution treated in the »General Part».

Finally I wish to express my heartiest thanks to all those who have given me help with the illustrations in my paper: Miss U. BRAUNS, who has painted the figures on plate VII, Mrs. N. LEPIKSAAR, Miss E. TOBIAESON and Miss A. WÄSTFELT, who have made the Indian ink drawings for the textfigures, Dr. JOHN ERIKSSON, who has given me permission to reproduce some of his photographs of freshly captured fish specimens, and Fil. kand. V. FONTAINE, who has taken the photos of the preserved fishes. Last but not least I am very much indebted to Mr. CHARLES BARBER, M. A. for his very valuable help in correcting my English manuscript.

PART I: DESCRIPTION OF THE MATERIAL

Family SYNODONTIDAE

Genus **Bathysaurus** GÜNTHER

Bathysaurus mollis GÜNTHER

(Plate I, fig. 3; Textfig. 1)

Synonyms and Literature:

Bathysaurus mollis GÜNTHER 1878 p. 182; 1887 p. 183, Pl. XLVI, figs. B, B¹; VAILLANT 1888 p. 385; GOODE & BEAN 1895 p. 59; VAILLANT in ROULE 1919 p. 130; TOWNSEND & NICHOLS 1925 p. 10, Pl. I, fig. 1; KOEFOED 1927 p. 62; FOWLER 1936 p. 346, fig. 162.

Bathysaurus obtusirostris VAILLANT 1888 p. 136, Pl. X, figs. 2, 2 a—g; Pl. XIV, fig. 3.

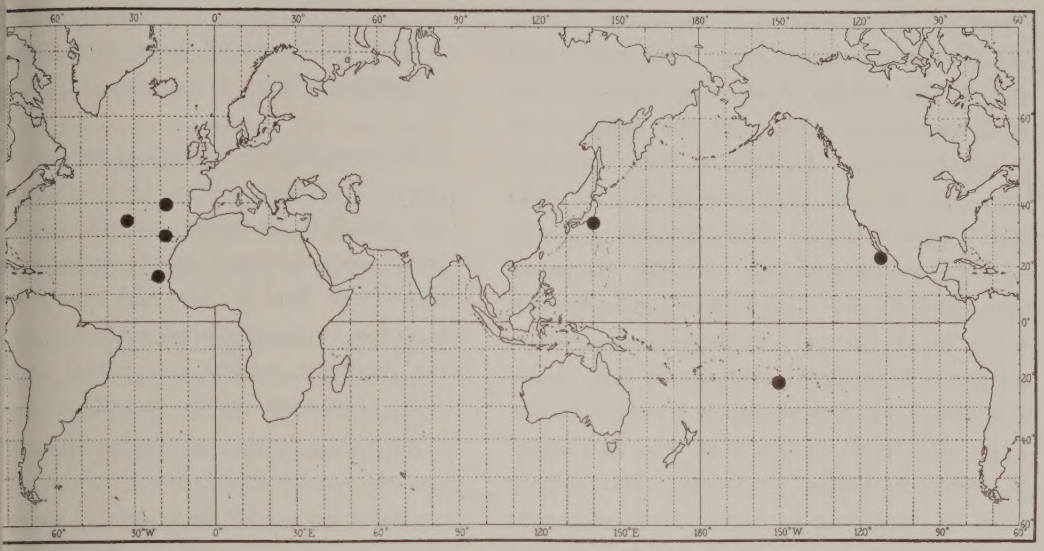
Material: St. 313 (Haul No. 1), N 29° 48′ W 17° 39′ — N 30° 05′ W 17° 18′, June 16th 1948; depth 4,267—4,255 m: 1 specimen.

The specimen obtained is unfortunately not in a very good state, the fin rays are partly damaged and all scales are lost. Most of the features characteristic of this rare species are however clearly visible, so that the identification is beyond doubt. The snout, seen from above, is oval, the barbel-like appendage between the nostrils is present as well as the adipose fin on the back, and the anal is situated a rather long distance behind the dorsal. Concerning the dimensions of the various parts of the body there is also good agreement with the specimens hitherto attributed to this species. On our specimen I have taken the following measurements in mm (as the caudal is much damaged, the total length cannot be stated):

Length of body	198
Height of body (at origin of dorsal)	20
Height of caudal peduncle	
Breadth of body before pectorals	
Length of head	
Snout to line across centre of eyes	
Interorbital width	
Length of snout	
Horizontal diameter of eye	
Length snout to dorsal fin	
Base of dorsal fin	
End of dorsal to centre of caudal base	
Vertical from end of dorsal to anal	

To compare these measurements with for the other specimens known I have ma Table I for features already used by FOED (1927). The values for the »M Sars» specimen are taken from Ko those for the U. S. »Albatross» specime TOWNSEND & NICHOLS (1925), those f two »Challenger» specimens and fo obtained at the »Princesse-Alice» St. 7 based on my own measurements duri visits to London and Monaco; these lastnamed specimens are more or less and the values for height and breadth quently somewhat uncertain. VAILLANT specimen of *B. obtusirostris* was unfortu not accessible to me during my visit t because of the moving of the ichthyo collections at that time; the values f specimen mentioned here are conse taken from VAILLANT (1888). In the ta specimens are sized according to inc body length.

Regarding the number of fin rays G (1887) gives D 15 A 11 P 15 V 8. re-examination of his two specimens however found in the larger D 15 A 1



Textfig. 1. Distribution of *Bathysaurus mollis* GÜNTHER.

nd in the smaller D 16 A 12 P 16 V 8. he specimen in the Monaco collections e counted D 16 A 12 P 15 V 8 and in the t specimen D 16 A 12 P 16 V 8. KOE- gives D 15 A 13 P 16 V 8 and VAILLANT A 11 P 16 and V 8. For the six specimens to known the fin formula is thus

$$\frac{16}{3}\,A\,\frac{11}{1}\,\frac{12}{4}\,\frac{13}{1}\,P\,\frac{15}{2}\,\frac{16}{4}\,V\,\frac{8}{6}.$$

NTHER describes a curious coloration of mall specimen: »In the young specimen ody and tail are ornamented with fourteen w vertical bars, composed of minute ent spots, and reaching across the whole of the body. In the interspaces between there is a shorter bar which does not d upwards beyond the lateral line. A rn of coloration of this kind is of extre- rare occurrence in deep sea fishes.» accompanying figure (Pl. XLVI, fig. B[1]) s however about 17 larger bars. In our men, the next smallest one known, are traces of a similar coloration, but also the number of larger bars seems about 17 (Plate I, fig. 3). This colo- n, obviously a juvenile one, thus seems to persist up to a body length of at least 200 mm.

Bathymetrical distribution. The shallowest catch hitherto made is that of »Michael Sars», at a depth of between 2,615 and 2,865 m, the deepest that of the »Challenger» St. 281, 4,362 m, and at about the same depth, 4,360 m, the specimen from the »Princesse-Alice» St. 753 was taken. The other finds are rather evenly distributed between these limiting values; our specimen was taken at a depth of 4,267—4,255 m.

Hydrographical conditions. The bottom temperatures for the two »Challenger» stations 237 and 281 in the Pacific, where *B. mollis* was captured, were +1.83 and +1.61° C respectively. For the Atlantic stations the temperature is given only for the »Talisman» St. CII, where the bottom temperature was +2.3° C. At St. 313 of the Swedish Deep-Sea Expedition, where our specimen was taken, the bottom water had a temperature of +2.42° C and a salinity of 34.89 ‰.

Geographical distribution (Map, Textfig. 1). The two specimens originally

described by GÜNTHER were taken during the »Challenger» Expedition off Yedo (St. 237) and in the middle of the South Pacific (St. 281) respectively. Later it was rediscovered in the north-east Atlantic by the »Talisman» (St. CII), by the »Princesse-Alice» (St. 753) and by the »Michael Sars» (St. 53), at each of these stations in only a single specimen. Our specimen was taken about midway between the »Talisman» and the »Princesse-Alice» stations. A further locality from the Pacific is recorded by TOWNSEND & NICHOLS at the U. S. »Albatross» St. 5684 off the west coast of southern Lower California. The species must be considered as cosmopolitan although, however, it has not yet been found in the Indian Ocean.

Family BATHYPTEROIDAE

Genus **Bathypterois** GÜNTHER

Bathypterois longipes GÜNTHER

(Plate I, fig. 1; Textfig. 2)

Synonyms and Literature:

Bathypterois longipes GÜNTHER 1878 p. 184; 1887 p. 188, Pl. XLVIII, fig. A; GOODE & BEAN 1895 p. 66 and 511, fig. 76; JORDAN & EVERMANN 1896 p. 546; REGAN 1911 p. 127; MURRAY & HJORT 1912 p. 396; KOEFOED 1927 p. 63; PARR 1928 p. 26 e. p. (including also *B. longicauda* GÜNTHER).

Bathypterois sp. VAILLANT in ROULE 1919 p. 130.

Material: St. 313 (Haul No. 1), N 29° 48′ W 17° 39′—N 30° 05′ W 17° 18′, June 16th 1948; depth 4,267—4,255 m: 1 specimen.

St. 329 (Haul No. 3), N 09° 38′ W 26° 20′—N 09° 50′ W 26° 30′, July 3rd 1948; depth 5,610—5,600 m: 11 specimens.

St. 387 (Haul No. 13), N 40° 33′ W 35° 24′—N 40° 34′ W 35° 52′, Sept. 7th 1948; depth 4,540—4,600 m: 6 specimens.

St. 401 (Haul No. 14); N 43° 40′ W 1
N 43° 20′ W 18° 59′, Sept. 15th 1948
5,000—5,025 m: 2 specimens.

Not less than 20 specimens belonging
genus *Bathypterois* have been caught
the Swedish Deep-Sea Expedition; r
them were however much damaged
trawl as to their fin rays and loose jaw
is much to be deplored since the le
the produced ventral and caudal ray
to be of interest for the identification.

According to the key to the species
genus given by PARR (1928), all the sp
captured belong to *Bathypterois longipe*
THER, to which PARR refers also *B. lon*
GÜNTHER. The only well-preserved sp
having the ventrals as well as the
practically undamaged, that from S
with a body length of 113 mm (reckon
tip of lower jaw to base of middle caud
has only moderately produced ventr
about 30 % of body length, about as
figure of the type specimen, and furt
two lowermost caudal fin rays thicke
not produced. On the other hand t
large and comparatively well-preserv
cimens from St. 401, with a body le
203.5 and 193 mm respectively, have
produced ventral rays, in the preser
about 66 and 60 % of body length respe
about as in *B. longicauda*, and m
strongly produced caudal rays. I t
at first was inclined to suppose the
of two distinct species with moderat
very strongly produced fin rays respe
the former being identical with *B. longi*
latter with *B. longicauda*. In other r
however, I could not find any differe
importance, particularly not concern
various proportions of the body or
number of scales and of gill-rakers on
branchial arch. In these respects th
material seemed to be quite homo
Moreover, in some of the larger specime

57 the produced ventral rays, although bly not quite undamaged as to their al length, seemed to show intermediate ions between the small and the larger nens just mentioned, indicating that the nces in the percentual length of these s only due to the different size of the nens and consequently of no specific

comparison with specimens in other ions has only confirmed this result. two specimens from the »Challenger» lition, including the type specimen, which the opportunity to see during my stay ndon, and the two from the »Michael Expedition, kindly lent out to me from luseum of Bergen, seem to differ in no respects from our specimens than in the of the produced ventral rays, being intermediate between the two above oned extremes in our material, the enger» specimens having rays of about rtionately the same length as the larger nens from St. 387. The small specimen at »Princesse-Alice» St. 527, identified AILLANT as *Bathypterois* sp., which I have n the Musée Océanographique at Monaco, eems to fit well into the series of measure-, given in Table II, in which I have put ner some measurements and counts for naterial studied by me except for the damaged specimens. In some cases the s are somewhat approximate because of ore or less damaged state of these speci- also.

ing into consideration that the produced al rays in the larger specimens from St. re probably somewhat shortened because mage and apart from the fact that the ntual length of these rays is somewhat in the »Michael Sars» specimens than in lightly larger specimens taken by the enger», indicating a rather great variabi- n this respect, there seems, judging from alues in Table II, to be an increase in length of these rays with increasing body size. The producing of the lowermost caudal rays is also more advanced in the »Michael Sars» specimens than in the original material, but these rays seem to vary even more irregulary as to length than those in the ventrals; it seems however as if produced caudal rays are developed only in specimens with a body length greater than about 140 mm. Judging from fig. 76 by GOODE & BEAN (1895), at least this specimen coincides very well in these respects with the type specimen of about the same size; unfortunately no information is given about the development of the ventral and caudal rays for the smaller specimens mentioned by these authors.

Concerning the length of the produced ventral and caudal rays in other species of the genus *Bathypterois*, earlier authors have found a great variability which may be clear from the following quotation from PARR (1928 p. 30): »Differences in the relative lengths of the produced fin rays are entirely valueless as systematic characters on account of the great individual variations in this respect, as sufficiently illustrated by Garman's description of *B. ventralis*, from which the following passages may be quoted: 'Individuals vary much in the length of the ventrals, on some they reach but little if any behind the anal, on others considerably behind the base of the caudal.' 'The difference between the upper and lower lobes of the tail is hardly perceptible on small specimens, but increases with age.'»

As to the number of fin rays I have found the following values in the specimens investigated by me (in one or two specimens some of the fins were too damaged to be counted exactly): D $\frac{12}{1}\ \frac{13}{1}\ \frac{14}{18}\ \frac{15}{4}$ A $\frac{9}{2}\ \frac{10}{20}\ \frac{11}{3}$ lower portion of P $\frac{8}{2}\ \frac{9}{5}\ \frac{10}{12}\ \frac{11}{3}$. GÜNTHER and KOEFOED give the number of rays in the dorsal as 13, but in all their speci-

mens I have counted D 14; the last dorsal ray as well as that in the anal are often double but have been counted by me as one ray. For the rays in the lower portion of the pectorals GÜNTHER gives 7—8 rays; in both his specimens I have found 8 rays, which is the lowest value for all the specimens investigated by me. In many specimens it was impossible to count the number of scales in the lateral line, and even in the specimens counted there was in some cases a little incertitude about the exact number; with this reservation I have found $\frac{54}{2}\ \frac{55}{9}\ \frac{56}{1}$, which is in good accordance with the number 55 given by GÜNTHER and by KOEFOED.

Taking all these facts into consideration I can not arrive at any other conclusion than that all the specimens investigated by me belong to one and the same species, in which the produced ventral and caudal rays are very variable in length but on the whole increasing with increasing body size in specimens of more than about 140 mm body length. All the *Bathypterois* specimens taken during our expedition must consequently be identified as *Bathypterois longipes* GÜNTHER.

Regarding *B. longicauda*, PARR (1928 p. 26, note 11) writes: »In the author's opinion *B. longicauda* is not taxonomically differentiable from *B. longipes* according to the description rendered by GÜNTHER.» There are, however some remarkable discrepancies in some of the proportions; the head and the caudal fin are extremely large, the former being about 30 % of the body length; further, the lower pectoral fin rays reach the base of the caudal fin, and the two longest rays in the ventrals are strongly produced, much more than in considerably larger specimens of *B. longipes*. This small specimen looks to me like a monstrosity of some kind, perhaps a specimen reduced by famine or more likely one with abnormally shortened vertebral column as known occasionally occurring in many species of fishes. This latter supposition easily be verified or rejected by an photo. Whether it represents a spe its own, or to what species it may belong to me questionable, but many features in favour of an identification with *B. l* and the number of fin rays, D 12 A 10 according to my own counts (GÜNTHE A 9), seems not to contradict this. Pe I am however at present most inclined identify *B. longicauda* with *B. longipes* consider it as a *species inquirenda*. Fr point of view of nomenclature the c is of no importance in this connection name *longipes* is the earlier employ consequently has priority.

Bathymetrical distribu According to our trawls *B. longipes* is commonest bottom fish in the North below 4,000 m as it was taken at four c stations in 20 specimens altogether an following depths: 4,267—4,255, 4,540 5,000—5,025 and 5,610—5,600 metre type material from the »Challenger» was captured at a depth of 4,849 m, th men obtained by the U. S. »Albat 4,569 m and that taken by the »Princes at 4,020 m. There are however also from shallower depths; the »Micha specimens were taken between 2,615 a m, and if the identification of the sm mens taken by the »Fish Hawk» and th is correct, it has also been captured 986 and 826 m. *B. longipes* thus see an extremely eurybathic species.

Hydrographical condi Apart from the somewhat uncertain s taken by the »Fish Hawk» and the which were captured at stations with temperature of +4.17 to +4.44° C, *B* has been obtained only in rather col At the »Challenger» St. 325, the type of the species, the bottom water ha perature of +0.39° C. The bottom ten at the U. S. »Albatross» St. 2225 was

Textfig. 2. Distribution of *Bathypterois longipes* GÜNTHER.

ecimens were taken at stations with . temperatures of +2.42, about 2.35, nd about 2.70° C and with a salinity it 34.87 to 34.93 ‰.

graphical distribution (Map, . 2). The first record of this species es from the South Atlantic, at the Inger» St. 325. All later finds were n the North Atlantic or in the Gulf of (if the identifications are correct), east coast of the United States and e Azores. Two of our stations where ecies was captured (St. 387 and 401) he north of the latter, one (St. 313) e Canaries and one (St. 329) SE of the Verde Islands. Through these new its we have consequently got a fuller of the geographical distribution of ecies than hitherto. If *B. longicauda* should prove to be identical with *B. longipes* the distribution also comprises the Pacific Ocean.

Family IPNOPIDAE

Genus **Bathymicrops** HJORT & KOEFOED

Bathymicrops regis HJORT & KOEFOED

(Textfig. 3)

Synonyms and Literature:

Bathymicrops regis HJORT & KOEFOED in MURRAY & HJORT 1912 p. 88, fig. 305, 501 d; KOEFOED 1927 p. 64, Pl. v, fig. 1—3; PARR 1928 p. 23; FOWLER 1936 p. 347, fig. 163.

This species was first mentioned and figured in MURRAY & HJORT 1912 but was first fully described as n. g. n. sp. by KOEFOED 1927. Following this, PARR (1928) has KOEFOED as

single author, whereas FOWLER (1936) has MURRAY & HJORT as authors' names. It is obvious that MURRAY had nothing to do with the denomination of the new fishes obtained during the »Michael Sars» Expedition, and HJORT himself speaks, at the first mention of this new species, of »a new form resembling *Ipnops murrayi*, for which KOEFOED and I propose the name *Bathymicrops regis*», (MURRAY & HJORT 1912 p. 87—88). From this it seems to me quite clear that both HJORT and KOEFOED are the authors of the generic as well as of the specific name of this species.

Material: St. 313 (Haul No. 1), N 29° 48′ W 17° 39′—N 30° 05′ W 17° 18′, June 16th 1948; depth 4,267—4,255 m: 2 specimens.

St. 342 (Haul No. 4), N 01° 03′ W 18° 40′—N 00° 58′ W 18° 37′, July 16th 1948; depth 5,250—5,300 m: 4 specimens.

St. 363 (Haul No. 8), N 12° 22′ W 52° 00′—N 12° 13′ W 51° 44′, Aug. 3rd 1948; depth 5,044—5,033 m: 1 specimen.

Of this curious and very characteristic species, hitherto known only in a single specimen, the Swedish Deep-Sea Expedition has taken 7 more specimens from three various localities. Most of them are in a good state: only that from St. 363 is somewhat damaged, but its belonging to this species is without doubt. All the specimens showed, when captured, the brownish coloration with the characteristic dark transverse bands, already mentioned and figured by KOEFOED. In size as well as in the proportions of the various parts of the body they agree very well with the original description, which can be seen in Table III, except that the height of the body is somewhat greater in my specimens, probably owing to the fixation in formalin.

As to the number of fin rays I have found the following values: D $\frac{9}{5}$ $\frac{10}{2}$ A $\frac{13}{5}$ $\frac{14}{2}$ P $\frac{9}{1}$ $\frac{10}{6}$ V $\frac{8}{7}$. KOEFOED gives the fin formula D 11 A 14 P 9 V 8, or a good agre[ement] except for the dorsal; according to a [com]munication by letter from Mr. Koe[foed] the statement of 11 dorsal rays is a m[istake] for 10. The coincidence between my spe[cimens] and the type specimen is therefore a co[mplete] one in this respect also.

Bathymetrical distribu[tion]. The depth at which the type specime[n] taken is said to be about 5,000 m. Acc[ording] to our catches we now can state tha[t the] species occurs at least in depths be[tween] 4,267—4,255 and 5,250—5,300 m, or a v[ertical] range of distribution of more than [1,000] metres.

Hydrographical condit[ions]. About this nothing is stated for the type specimen. As to the temperature, th[e] specimens have been captured at [+2.28] +2.28 and about +1.65° C respectively [and] corresponding values for the salinit[y] 34.89, 34.85 and about 34.83 ‰.

Geographical distribution (M[ap] Textfig. 3). The type specimen of *B[athymi]crops regis* was taken at N 28° 54′ W [long.] (»Michael Sars» Stat. 48), and the spec[ies] hitherto not been recorded from any [other] locality. Our catches thus enlarge the [known] area of distribution considerably. It [is] special interest that it occurs also to th[e west] of the Atlantic Central Ridge, which [conse]quently for this species forms no insu[rmoun]table barrier between the East and the [West] Deep-Basins of the North Atlantic.

Bathytyphlops n. g.

To the type species of the genus *B[athymi]crops*, NORMAN (1939) has added one [more] species, *B. sewelli* from the Arabian S[ea] 171 of the »John Murray» Expedition, [at] 3,840—3,872 m. From the description [given] by NORMAN it is clearly to be seen th[at the] validity of this new species is beyond [doubt]. The differences between it and *B.*

3. Distribution of *Bathymicrops regis* HJORT & KOEFOED (○ = type locality, ● = Sw. Deep-Sea Exp.), *Sciadonus kullenbergi* n. sp. (▲), *Leucochlamys cryptophthalmus* ZUGMAYER (■), and *L. jonassoni* n. sp. (◆).

reality of such an importance that the
on may arise whether they can be
d in one and the same genus.

generic diagnosis given by KOEFOED
is rather meagre: »Eyes vestigeal,
d by scales; dentition feeble.» NORMAN
ven a fuller diagnosis, apparently based
sewelli as well as on KOEFOED's descrip-
B. regis. This latter species he obviously
t seen himself, as in his diagnosis there
me features stated which are not men-
by KOEFOED and not referable to
s. Because of this I used the opportunity
my visit to the British Museum in
n to compare the two species directly,
which only strengthened my suspicion that they are rather unlike in many respects, not only in general appearance (*B. sewelli* has a rather large stout and high body, quite different from that of the small and slender *B. regis*) but also in many other characteristics of systematical value. Following the generic diagnosis given by NORMAN I have put together the most important differences or those considered by me as being of generic value. From this comparison it will be evident, I think, that the two species may conveniently be separated into two different genera. For the new genus, including *B. sewelli* NORMAN, I propose the name *Bathytyphlops*.

Bathymicrops Hjort & Koefoed

Body small, very elongate, almost cylindrical, the belly flat between the ventrals.

Body covered with cycloid scales of rather large size.

Head much depressed, completely scaled, snout spatulate.

Eyes vestigeal, covered by scales.

Nostrils before the eyes, not close together.

Gill-rakers rather long, about 14 on the first arch.

Type species: *B. regis* Hjort & Koefoed, Atlantic Ocean.

Bathytyphlops n. g.

Body rather stout and elongate, mode[rately] compressed.

Body covered with cycloid scales of mo[derate] size.

Head a little depressed, completely [scaled] snout not spatulate.

Eyes absent.

Nostrils near tip of snout, close together

Gill-rakers reduced to a few short, denti[form] knobs.

Type species: *B. sewelli* (Norman). [Indian] Ocean.

Together with the genus *Iymops* Günther these two genera seem to constitute a natural [group]

Family MACROURIDAE

Genus **Nematonurus** Günther

Nematonurus armatus (Hector)

(Plate IV, fig. 5; Textfig. 4)

For Synonyms and Literature see Parr 1946.

Material: St. 313 (Haul No. 1), N 29° 48′ W 17° 39′—N 30° 05′ W 17° 18′ June 16th 1948; depth 4,267—4,255 m: 2 specimens.

St. 387 (Haul No. 13), N 40° 33′ W 35° 24′—N 40° 34′ W 35° 52′ Sept. 7th 1948; depth 4,540—4,600 m: 1 specimen.

This species has been described several times under various names, no doubt because of the fact that it varies rather considerably as to its taxonomical features and that it has a very wide geographical distribution. I myself have not had the opportunity to study specimens other than those captured during the Swedish Deep-Sea Expedition (during my visit to London I saw the type specimen of *N. armatus* but unfortunately I had no time to take any measurements), but the statements given by Koefoed (1927) and by Parr (1946) have convinced me that the synonymy given by the last named author must be correct.

From the specimens obtained durin[g the] expedition I have taken the following me[asure]ments in mm:

	Stat. 313		St. 38[7]
Total length	510	505 +	2[5]
Length of body	498	502	[23]
Length snout to anal fin	175	182	abt [2]0
Length isthmus to anus	112	116	[4]0
Length anterior end of ventral fin base to origin of anal	78	74	[1]8
Length snout to 1st dorsal	105	113	[1]4
Length anterior margin of orbital cavity to 1st dorsal	88	95	[1]6
Height of body at the eye	abt. 42	abt. 42	abt [7]0
Height of body at 1st dorsal	81	85	[8]0
Length of base of 1st dorsal	25	27	[3]9
Distance 1st dorsal to 2nd dorsal	63	61	[2]1
Length of head	94	101	[4]3
Length tip of snout to orbit	25	26.5	[3]6
Median ventral length of snout	13.5	14	[2]0
Horizontal diameter of orbit	18	18.5	[2]5
Interorbital width	24	25	[3]8
Postorbital part of head	58	62	[8]5
Length of upper jaw	35	37	[5]8
Length of barbel	14	15	[2]2
Length of produced ventral ray	abt. 55	59/60	ab[t 9]2

To these measurements I may ad[d the] following remarks. The specimen from [387] with its 823 mm body length seems to [be]

specimen of this species hitherto cap- as the greatest length of the »Michael pecimens is recorded as 74 cm; it must owever be noted that the next largest 1, with a total length of 73 cm, has lost ermost tip of the tail and has a head of 146 mm or 3 mm more than our specimen, from which a body length east 835 mm can be calculated if the n had not been damaged. In our specimen the caudal fin rays have roken about 2 mm from their base. pecimen has moreover the abdominal very much distended (Pl. IV, fig. 5), which s the disproportionately large dimen- or greatest depth, length isthmus to nd anterior end of ventral fin base n of anal.

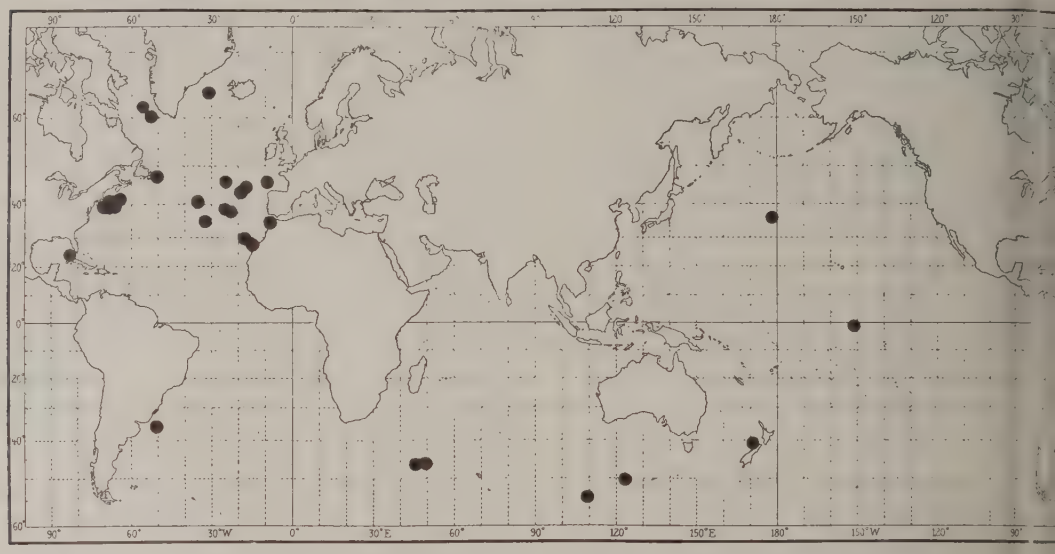
comparison with KOEFOED's measure- on the »Michael Sars» material and the age values given by PARR I refer to owing Table IV, in which the measure- given by VAILLANT for his *Coryphae- igas* have also been included.

this comparison it can be seen that very good agreement in most respects we my material and that studied by the er authors named in the table. Apart m e above mentioned proportions which i uenced by the dilatation of the air dd there are only a few minor discrep- ies The length of the upper jaw is greater an ven by PARR, whereas the length of rbel is somewhat shorter; in the latter pec my measurements are however in od greement with those given by KOEFOED. va ies for length of base of 1st dorsal are th other hand consistently greater than ose und by me, or 30—35.5 % of length of ad stead of 26.6—27.3 %, but here my re in good agreement with that found R, about 26 %. The most striking es seem to be found in the length 1st dorsal; in this respect the speci- m St. 313 show extremely low values that from St. 387 an extremely high one, but there seems to me to be no reason to doubt the identification only on this apparently rather variable feature alone.

The 1st dorsal has 11 (II+9) rays in the two smaller specimens and 10 (II+8) in the large one; in the smaller the second spine is conspicuously serrate, in the large one it is almost smooth, just as VAILLANT describes it for his *C. gigas*. The pectorals have in the smallest specimen 20 rays, in the next smallest 21, and in the large one 19/20 rays. Ventrals with 10 rays in all three specimens. In the second dorsal I have counted 97, 112 and about 113 rays, in the anal 108, 119 and about 120 rays respectively. These values are in good accordance with the statements by previous authors, as can be seen from the following list:

	D_1	D_2	A	P	V
GÜNTHER 1887 (*armatus*)	11	—	—	18—20	9—10
GÜNTHER 1887 (*affinis*)	11	—	—	19	10
VAILLANT 1888 (*gigas*)	10	87	107	—	10
GOODE & BEAN 1895 (*goodei*)	10—11	105	111	20	10
LÜTKEN 1898 (*goodei*)	11	—	—	19	9—10
KOEFOED 1927	10—11	—	—	18—21	9—10
SCHROEDER 1940	10	90	92	20	10
PARR 1946	10	—	—	18—20	10

The coloration is said by GÜNTHER to be »Brownish-black» (*affinis*) or »reddish-brown» (*goodei*), by GOODE & BEAN (*goodei*): »Color dark reddish brown, the spines upon the scales with a metallic luster», by SCHROEDER »Color blackish» and by PARR »Dark brown. Mouth, gill cavity and peritoneum black». VAILLANT describes the colour of his *gigas* as follows: »Tout l'animal est d'un gris souris, avec la membrane branchiostège et les nageoires brunâtres», and ROULE 1919 (*gigas*): »La coloration, sur les individus conservés, est de teinte gris ardoise pour le tronc, plus claire en avant. La tête est gris-jaunâtre lavé de bleu dans les regions buccale et operculaire. La plupart des nageoires sont aussi gris-jaunâtres, sauf les pectorales qui se montrent plus foncées et



Textfig. 4. Distribution of *Nematonurus armatus* (Hector).

presque brunes». The general coloration of the body of our specimens was brownish to reddish brown, on the parts where the scales were preserved with a grayish to bluish tint according to light. The ground colour of the head was bluish; all naked parts of the head lighter or darker blue, the scaled parts brownish on blue ground. In the smaller specimens the somewhat damaged fins had about the same brownish colour as the body with the pectorals apparently somewhat darker, in the large one all fins were darker than the body, the pectorals very dark brown, almost blackish; the barbel in this species was very dark. The mouth was bluish, the gill cavity black.

Bathymetrical distribution. The 34 records of *N. armatus*, hitherto known, indicate that this species has a very wide range of distribution as to depth. The type specimen from off Cape Farewell, New Zealand, was taken in rather shallow water, 732 m, and two of the »Blake» stations (St. 76 and 309) were still shallower, 281 and 556 m respectively. The remainding 31 finds however are fairly evenly distributed between 2,285 m (U. S. »Albatross» St. 2534) and 4,700 m (»Michael Sars» St. 10), with 15 finds between 2,200 and 3,000 m, 9 between 3,0 4,000 m, and 7 between 4,000 and 4. which seems to be the lower limit of it regular occurrence, as a comparativel number of trawls are now made belo depth, all without catches of this app fairly common species.

Hydrographical conditi For 24 of the records of *N. armatus* ju tioned, information is given about the rature of the bottom water, which between ± 0 and $+4.72°$ C; unfort there is no temperature observation f shallowest station (»Blake» St. 76), values available indicate that this sp rather eurytherm. As to salinity, our sp have been taken in bottom water of 3 (St. 313) and 34.93 ‰ (St. 387).

Geographical distributio Textfig. 4). Provided that all sp now referred to *N. armatus* according synonymy given by Parr really belon species, it has been found in all the three Most of the finding places, includin from the Swedish Deep-Sea Expedit situated in the North Atlantic, whic surprising, as most of the deep-sea i

have been carried out here. In con-
y with its apparently high tolerance of
emperatures, it has however also been
in Greenland waters by the Danish
f» Expedition up to N 64° 34′, as well
the Antarctic parts of the Indian Ocean
to nearly S 54° by the »Challenger»
ition. Moreover it has been taken by
hallenger» in the South Atlantic and in
id Pacific. Its general distribution must
quently be characterized as cosmopolitan.

Genus **Chalinura** Goode & Bean

his valuable treatment of the »Macrou-
of the Western North Atlantic and
l American Seas», Parr (1946) has
d to the genus *Chalinura* not only *Ch.*
Goode & Bean and *Ch. brevibarbis*
& Bean but also *Coryphaenoides cara-*
Goode & Bean. For reasons given
(p. 273) I prefer to consider the last
species as a member of the genus
us.

Of he two remaining species only the first
was taken by the Swedish Deep-Sea
ition, but, in addition, a further species
o not described, as far as I can see,
tained. This find has made it necessary
dy also other species of this genus, not
by us, and I have thereby obtained
complementary facts about these species.
following pages I will therefore add to
escriptions of the species belonging to the
ion of the expedition some remarks also
Ch. brevibarbis and *Ch. leptolepis* (Gün-
as the latter seems to be so closely
to *Ch. simula* that a re-examination of
gle specimen hitherto known seemed to
be of interest in this connection.

For the sake of comparison I have found
enient to put together in one and the
able (Table v) the percentage values for
st important features according to Parr
of all the species here mentioned, and
ss it before the treatment of the separate
species. The table contains the values for the measurements of all the specimens which have been available to me and further, to make up the number, all the values which can be calculated from the measurements given by Koefoed (1927) whenever I have not had the opportunity to re-examine his material; to this the corresponding limit values given by Parr are added. To elucidate to what degree the proportions studied may change with increasing size, the specimens are arranged for each species according to length of head, which is therefore given for each specimen in the first column, as in many cases the tip of the tail is broken and the total length cannot be stated.

To the table the following remarks may be added.

The features here listed are evidently not all of the same taxonomical value. Length of head and length snout to anal fin in % of body length are in many cases impossible to state as most specimens from great depths have lost a longer or shorter piece of the fragile tail; sometimes the broken tail has regenerated but in those cases the real body length cannot of course be stated either. These values are consequently of minor value for the identification in practice. Because of this the length of the head is a more practical standard of value than either of the lengths just discussed. As the produced ventral rays are often broken or lost, this feature is, like the body length, in many cases of very limited practical importance. Greatest depth of body seems to increase with increasing body size but seems also partly be due to the dilatation of the air bladder and other circumstances referable to the mode of fixation and preservation. The basal length of 1st dorsal also seems to vary considerably but without any correlation to body size or to number of rays and seems moreover to be of about the same percentual length in all species here treated and therefore of minor importance. Further the length base of ventral to anal seems to be rather variable in most species,

probably partly for the same reasons as those given for the greatest depth of body.

The diameter of orbit in % of length of head seems to some degree to offer values characteristic of each species, but at least for *Ch. brevibarbis* and above all for *Ch. profundicola* this value decreases with increasing body size, which must be taken into consideration if one wishes to use this feature for the identification of the species.

The safest and most valuable characteristics for the species diagnostic, judging from the values in the table, seems to be the length of the snout (distance tip of snout to orbit), the median height or ventral length of snout, the interorbital width, the length of upper jaw and of barbel, and, to some extent, the length snout to 1st dorsal. All these features seem to vary only within comparatively narrow limits for each species and seem moreover not to undergo greater changes with increasing body size but to be rather different for the different species. They seem consequently to be of the greatest value for separating the species *inter se* and have therefore, together with the form of the snout, been used for the following attempt to make a key for the species of the genus *Chalinura* here under consideration. This key is partly derived from that given by PARR (1946 p. 65) for the species treated by him.

Key to the species of *Chalinura* treated below.

A. Head more or less compressed, interorbital width less than 30 % of head, snout low, less than 15 % of head

1. Interorbital width as a rule less than 25 % of head, barbel more than 10 % of head

a. Length of barbel more than 20 % of head, distance snout to 1st dorsal less than 120 % of head

Ch. simula GOODE & BEAN

b. Length of barbel about 16 % of distance snout to 1st dorsal than 120 % of head

Ch. leptolepis (GÜN

2. Interorbital width as a rule more 25 % of head, barbel less than 10 head *Ch. profundicola*

B. Head not compressed, interorbital 30 % of head or more, snout high, than 15 % of head

Ch. brevibarbis GOODE &

Chalinura simula GOODE & BEA

(Plate III, figs. 3, 4; Textfig. 5)

Synonyms and Literature:

Chalinura simula GOODE & BEAN 1883 1895 p. 412, Pl. XCVIII, fig. 345; JORD EVERMANN 1898 p. 2578; 1900 Pl. CCCI fig. 910; ROULE 1919 p. 86; JORDAN, MANN & CLARK 1930 p. 204; SCHR 1940 p. 234; PARR 1946 p. 65, fig. 10 b, fig. 20.

Macrurus simulus GÜNTHER 1887 p. 14

Macrurus (*Chalinura*) *simulus* EHRE 1902 p. 117 e. p.; BRAUER 1906 p. 29 MURRAY & HJORT 1912 p. 398; K 1927 p. 100.

Coryphaenoides simulus GILBERT & 1917 p. 143; FOWLER 1936 p. 457.

Non *Macrurus* (*Chalinura*) *simulus* L 1898 p. 27.

From the synonyms given by PARR I have exluded LÜTKEN 1898. K (1927 p. 101) was already somewhat in about the correctness of the identificat LÜTKEN because of his statement th diameter of the eye is only about h interorbital distance. During a visit Zoological Museum in Copenhagen I been able to re-examine the »Ingolf» m in question, thanks to the kindness curator of the ichthyological departmen PFAFF. The results of my measure

ibled in Table v, clearly show that all Ingolf» specimens attributed to *Ch. si-* undoubtedly belong to *Ch. brevibarbis* E & BEAN. On the same occasion I had pportunity to see also the specimens sent mparison from the U. S. Nat. Museum, ich LÜTKEN refers. They were labelled: urus simulus 41° 09′ 40″ N. 66° 02′ 20″ J. S. Nat. Mus. 33396 8 · 10 1891» and urus simulus 41° 53′ N. 65° 35′ W. U. S. Mus. 33449 1 · 4. 1896» respectively. As e seen from Table v, these two speci- must also be referred to the species *arbis.* There must consequently have some kind of mistake in the labelling of two specimens, which explains the error e identification made by LÜTKEN. As tatements about *Ch. simula* given by NBAUM (1902) and BRAUER (1906) partly to the »Ingolf» material, these synonyms e list given above are consequently but rt referable to *Ch. simula.*

Material: St. 387 (Haul No. 13), N 40° 33′ W 35° 24′—N 40° 34′ W 35° 52′, Sept. 7th 98; depth 4,540—4,600 m: 1 specimen.

In addition to the single specimen captured ring the expedition I have for comparison btained a specimen by exchange from the U. S. Nat. Museum thanks to the kindness of Dr. . P. SCHULTZ. This specimen is labelled: 2572 40° 29′ 00″ N., 66° 04′ 00″ W. Sept. 35 Albatross Atlantic Ocean — off New d» Depth 1.769 fath. (= 3,235 m).

specimen is rather well preserved but unately all scales have been lost. Its t length is 325 mm, but the tip of the ail broken; there can, however, hardly be more than some few cm lost. The specimen ed from the U. S. Nat. Museum is hat smaller, with a present length of 285 ere, too, the tail is broken and relatively than in our specimen has been lost. I aken the following measurements in mm two specimens:

	Sw. Deep-Sea Exp. St. 387	U. S. »Albatross» St. 2572
Length snout to anal fin	102	90
Length isthmus to anus	63	52
Length anterior end of ventral fin base to origin of anal ..	38	27
Length snout to 1st dorsal ..	76	71
Length anterior margin of orbital cavity to 1st dorsal ...	62	58
Height of head at the eye ...	28	26
Height of body at the pectorals	45	43
Height of body at the 1st dorsal	49	45
Length of base of 1st dorsal .	15	15
Distance 1st dorsal to 2nd dorsal	27	26
Length of head	65	60
Length of snout	17	15
Width of snout	15	12
Height of snout	7.5	5.5
Horizontal diameter of orbit .	11.5	11
Interorbital width	16	14.5
Postorbital part of head	37	35
Length of upper jaw	29	25
Length of barbel	14.5	13
Length of produced ventral ray	49/49	54/51

Regarding the specimen taken during the Swedish Deep-Sea Expedition a comparison with the measurements given by KOEFOED (1927 p. 102) shows a very good agreement regarding most features, as can be seen from Table v. All values fall within the limits of variation found by KOEFOED except for that for the distance isthmus to anus, which is somewhat larger in my specimen, probably because of slight extension of the abdominal cavity due to the dilatation of the air bladder.

For a comparison with the percentage values given by PARR (1946) I may refer to Table v. Here too there is a good agreement concerning most features; the somewhat greater depth of body seems to be of little importance, as KOEFOED's measurements for most of his specimens give higher values, 70.19—85.60 %, and as the depth of body seems to alter with age. The small difference in the length of base of 1st dorsal seems also to be found in the material investigated by KOEFOED and consequently to be of no importance. The greater distance from anterior end of ventral

fin base to origin of anal fin is probably due to the same cause as the above-discussed greater length between isthmus and anus.

In the length of the produced 1st ventral rays there is, however, a remarkable difference, as those in my specimen are only about 75 % of length of head instead of 85—105 % according to PARR. They really reach only to the third and fourth anal ray respectively, corresponding to the distance between the base of the fin and the hindborder of the orbit. According to KOEFOED the produced ventral ray reaches »to the 18th—22th anal ray, and is slightly longer or a little shorter than the distance of the ventral fin from the point of snout». In the position of the fins there are also some differences. According to KOEFOED »the anal fin commences just behind the anus, exactly under the last ray of the 1st dorsal fin»; in my specimen the first anal ray is situated at a level about midway between 1st and 2nd dorsal. On the other hand PARR states: »Origin of 2nd dorsal well behind origin of anal, which is only a short distance behind end of base of 1st dorsal.» Taking into account that the base of the 1st dorsal in my specimen is relatively very short and that the distance isthmus to anus on the other hand is extremely long, the difference at least between my specimen and those studied by PARR seems consequently not to be of a very great importance. As moreover the number of fin rays, D_1 II 7 P abt. 19 V 9, is in good agreement with the statements by KOEFOED (D_1 II 7—8 P 18—19 V 9) and by PARR (D_1 10 P abt. 18 V 9) I think that there is no reason to attach too much importance to the greater distance isthmus to anus, the smaller length of the produced ventral rays or the other minor differences here mentioned. Consequently I find it justified to identify the specimen in question with *Chalinura simula* GOODE & BEAN.

Bathymetrical distribution. Excepting the two somewhat uncertain identifications from the »Blake» St. 317 and with depths of 611 and 1,184 m respect *Ch. simula* was previously taken in d varying between 1,919 m (»Princesse- St. 738) and 3,705 m (SCHROEDER 1940). catch made by the Swedish Deep-Sea E tion in a trawl between 4,540 and 4,6 thus represents the greatest depth at this species has been taken and the bathymetrical range downwards co ably.

Hydrographical conditi The values for the bottom temperatures stations at which *Ch. simula* was t during the »Blake» and the U. S. »Alba investigations vary between +3.22 and 7. this latter temperature refers however t of the »Blake» stations for which the iden tion of the material is uncertain. The h bottom temperature for the U. S. »Alba specimens is +5.0° C. The bottom tempe at the »Michael Sars» St. 88, depth 3,1 was about +2.5° C. At our St. 387, 4,563 m the temperature was +2.38 °C the salinity 34.93 (sample taken 5 m the bottom). This species seems conseq to be rather eurythermic.

Geographical distribution Textfig. 5). The type specimen of *Ch.* was taken by the »Blake» Expedition fr CCCVIII. At two other localities, the expedition obtained specimens »apparent longing to this species» (GOODE & 1895). According to the same autho U. S. »Albatross» Expeditions have ta at three more localities in the same are recently SCHROEDER (1940) mentions it these waters also; judging from the sp obtained from the U. S. Nat. Museu collection possesses specimens from lo hitherto not published. *Ch. simula* consequently to be widely distributed the West Atlantic Continental Slope. specimens obtained during the expe with »Princesse-Alice» and »Michael

Fig. 5. Distribution of *Chalinura simula* Goode & Bean (+ = earlier finds, ⊕ = Sw. Deep-Sea Exp.), *Echinomacrurus* Roule (○ = type locality, ● = Sw. Deep-Sea Exp.), *Bassozetus taenia* (Günther) (△ = type locality, ▲ = Sw. Deep-Sea Exp.).

e all taken on the Atlantic Central Ridge
ıe Azores and our specimen was captured
) to the west of the Ridge. No specimens
. however been taken along the compara-
y well investigated East Atlantic Continen-
l Slope. The statement by Parr, »Both
t of North Atlantic in warm waters», is
equently not quite correct according to
present knowledge. On the map, textfig.
l the localities mentioned are plotted in;
servation as to the somewhat uncertain
ities from the »Blake» must be made.
as been pointed out above in the dis-
son of the synonyms, the specimens taken during the Danish »Ingolf» Expedition and identified as *Ch. simula* do not belong to this species.

Chalinura leptolepis (Günther)

Synonyms and Literature:

Coryphaenoides leptolepis Günther 1877 p. 441; Gilbert & Hubbs 1917 p. 143.

Macrurus (*Chalinura*) *leptolepis* Günther 1887 p. 144, Pl. xxxi.

Chalinura leptolepis Goode & Bean 1895 p. 414; Koefoed 1927 p. 102.

The original description of this species, hitherto known only from the type specimen

taken at the »Challenger» St. 122, depth 640 m, shows such a coincidence with *Ch. simula* GOODE & BEAN, that one may suppose its being only a synonym of the latter species; KOEFOED (1927 p. 102) says: »The difference between *leptolepis* and *simulus* appears extremely small and uncertain. *Leptolepis* . . . has a smaller barbel, equal only to the longitudinal diameter of the eye. The outermost ray of the ventral fin is also shorter, reaching to the 13th anal ray. The distance between anus and isthmus is slightly greater than in *simulus*, being equal to the length of the head.» Especially as the specimen taken during the Swedish Deep-Sea Expedition, above mentioned and identified as *Ch. simula*, in the latter feature differs somewhat from the earlier descriptions of *Ch. simula* towards the characteristic given for *Ch. leptolepis*, and as moreover the produced ventral fin ray is even shorter than in this latter species, it seemed desirable to make a re-examination of the type specimen of *Ch. leptolepis*. On the other hand the distance snout to 1st dorsal as well as the distance between lower margin of orbit and upper jaw seemed, judging from the fig. Pl. XXXI by GÜNTHER (1887), to be greater in *leptolepis* than in *simula*.

During my visit to the British Museum (Nat. Hist.), London in spring 1948 I therefore used the opportunity to study the type specimen, from which I took the following measurements in mm:

Total length	abt. 440+?
Length snout to anal fin	158
Length isthmus to anus	abt. 102
Length anterior end of ventral fin base to origin of anal	63
Length snout to 1st dorsal	116
Length anterior margin of orbit to 1st dorsal	95
Height at the eye	42
Height at the pectorals	72
Height at the 1st dorsal	75
Length of base of 1st dorsal	
Distance 1st dorsal to 2nd dorsal	
Length of head	
Length of snout	
Width of snout	
Height of snout	
Horizontal diameter of orbit	
Interorbital width	
Postorbital part of head	
Length of upper jaw	
Length of barbel	
Length of produced ventral ray	abt.

From these measurements I have worked out the values necessary for comparison with those for *Ch. simula*, given by KOEFOED (Table VI) and by PARR (Table V). From these tables it can be seen that the two species are very much alike in most features; the only differences are the comparatively greater length in *Ch. leptolepis* of the distances isthmus–anus, base of ventral to anal, and snout–1st dorsal, whereas the barbel is relatively much shorter, about 16 % of length of head instead of 20—25 % of the same length in *Ch. simula*. On the other hand the comparatively large space between lower margin of orbit and upper jaw, indicated in the original figure, seems not to exist in reality, as I found this distance to be 12.6 % of length of head in *Ch. leptolepis*, and 12.3 and 12.5 % respectively in the two specimens of *Ch. simula* at my disposal, i. e. that taken during our expedition and that obtained in exchange from the U. S. National Museum.

This comparison has consequently led me to the conclusion that *Ch. leptolepis* and *Ch. simula* are two closely related but clearly distinguishable species of the genus *Chalinura*.

Chalinura profundicola n. sp.

(Plate II, figs. 2—5, III, figs. 5—8; Textfigs. 7, 10)

Syn.: *Macrurus* (*Chalinura*) *brevibarbis* GOODE & BEAN & HJORT 1912 e. p.; KOEFOED 1927 e. p. (the specimen from »Michael Sars» St. 10)

erial: St. 313 (Haul No. 1), N 29° 48′ 17° 39′—N 30° 05′ W 17° 18′, June 16th 48; depth 4,267—4,255 m: 4 specimens. St. 319 (Haul No. 2), N 22° 31′ W 23° 28′— 22° 41′ W 23° 10′, June 21st 1948; depth 872—4,867 m: 2 specimens.

e specimens in question seemed at first to be rather unlike one another, especially ding the size of the eye, which is comively much smaller in the two large mens from St. 319, but judging from v this feature, like the greatest depth ne body, seems to alter gradually with and rather considerably, whereas the features are more constant and not ct to greater variations than for other es.

cause of some minor differences in the urements given by KOEFOED (1927) bethe specimen from St. 10 and the others ified by him as *Macrurus* (*Chalinura*) *barbis*, together with the fact that it taken at a much greater depth, the susn arose in me that the specimen in ques could belong to this new species. Thanks he kindness of Prof. H. BRATTSTRÖM, en, I got the specimen as a loan and can that it really belongs to *Ch. profundicola*; his small specimen alone it would hardly ossible to detect the small differences the closely related *Ch. brevibarbis*.

fore giving a short description of the species the measurements in mm taken he specimens at my disposal may be nted.

profundicola may attain a considerable as the two large specimens from St. have a total length of 767 and 676 mm ctively. In their general appearance the mens obtained are in many respects mediate between *Ch. simula* and *Ch. barbis*, combining features from them both. trunk is moderate; distance from snout to fin about 30—35 % of total length or 1.4—1.7 times length of head; tail tapering rather rapidly from the trunk. Greatest depth 70—92 % of length of head, increasing with age, in the two largest specimens about 17—18 % of total length; the high values for the largest specimens seem however partly to be due to the dilatation of the air bladder.

The head is somewhat compressed, its length in the two largest specimens is about 20 % of total length. Dorsal profile concave above the orbits, slightly convex over the nasal region. Snout nearly vertical, very low, its median height only about 7—9 % of length of head; tip of snout slightly projecting; width between the lateral corner 20—23.5 %, length 25.5—27 % of length of head. Mouth large, subterminal, upper jaws 46—49 % of length of head. Barbel very small, about 5—9 % of length of head. Eyes small, decreasing proportionately with increasing body size; diameter of orbit 12—18 % of length of head. Interorbital width 1.56—2.25 times the diameter of the orbit, about 25—28 % of length of head. First gill slit wide, 25—30 % of length of head. 10—11 spinigerous tubercular gill-rakers on lower part of second branchial arch, the uppermost more or less opposite and fusing together, forming ridges across the arch. Teeth in upper jaw in a band with an outer series of about 16—27 enlarged, inwards curved fangs (Textfig. 7 p. 274); in lower jaw they are situated in a single row, except at the symphysis where some inner teeth also are present.

The number of fin rays in our specimens seems to be $D_1 \frac{9}{4} \frac{10}{2}$ P $\frac{18}{5} \frac{19}{1}$ V $\frac{9}{6}$, but as all fins are more or less damaged, the number given for the pectorals is somewhat uncertain. In the specimen from »Michael Sars» St. 10 I have counted 10 rays in the 1st dorsal and 18 in one of the pectorals, the other fins are too damaged to be counted with any accuracy. In the two largest specimens, which have the tail undamaged, I have counted in the 2nd

dorsal 97 and 91 rays and in the anal 104 and 96 rays respectively. The pectorals are situated slightly in advance of 1st dorsal, the ventrals below or slightly behind the pectorals; origin of 2nd dorsal well behind origin of anal, which is distinctly behind end of base of 1st dorsal. Base of 1st dorsal about 19—28 %, its height (in one specimen) 51.15 % of length of head, length snout to 1st dorsal about 11—20 % longer than head. Distance from anterior end of ventral fin base to origin of anal fin about 42—60 % of length of head, increasing with size. Length of pectoral (in one specimen) 55 %, produced ventral rays (preserved only in the two largest specimens) 70—85 % of length of head.

Unfortunately all specimens have lost the body scales except some few scales in the two largest specimens, but judging from the mostly well marked scale pockets there may be about 36—40 scales in a longitudinal row from shoulder over a distance equal to that from snout to 1st dorsal. In the two largest specimens there are some scales on the throat preserved; they have some few, generally three, rows of very strong spines forming crests or keels. The scales preserved at the base of the 1st dorsal with only some few small spines or almost spineless, those on the back between 1st and 2nd dorsal (only in the largest specimen are some of these scales present) with 5 series of comparatively small spines, not fused at their base. The lateral line is curved above the pectorals and the pores are here very conspicuous as far as the lateral line scales are preserved.

The head scales are entirely lost in the two smallest specimens from St. 313 as well as in that from »Michael Sars» St. 10, except for some of the comb-like scales on the ridges of the snout. The two other specimens from St. 313 have besides some few scales around the eyes and on the neck preserved. Of the two largest specimens (St. 319), the smaller has the squamation on the head almost complete and has therefore been chosen as type spe of the species. The upper parts and the i are covered with scales of varying size largest on neck, on preoperculum and ove supraorbital branches of the lateral line sy on the upper surface of the head, all a with diverging rows of stout erect spine the angles between the median and the l keels on the snout there are small sca areas but traces of scale pockets indicate no naked areas really exist on the sno this species. The region below snout is sca but groups of scales are here and there pr between the mouth and the lower ed suborbital bones below and behind the Lateral surface of lower jaw without s but its ventral surface with groups or of scales indicating a more continuous squ tion. Some scales, preserved on the operc are large and without or with only som spines, just as those at the base o dorsal. In the largest specimen the squ tion on the head is of the same general racter but more defective than in the specimen.

The colour of the specimens just cap was a light brownish grey, with the head the abdomen light bluish, but as the squ tion of the body is practically missing colour in undamaged specimens is, ju from the scaled patches, darker brow Oral cavity bluish, gill cavity and perito black.

From the description given above it is that *Ch. profundicola* is a typical repres tive of the genus *Chalinura*, well distingu from the other deep sea species hitherto k The very low snout and the very short h together with the long upper jaw and the first gill slit seem to be its most characte taxonomical features.

Bathymetrical distribut All specimens hitherto known were cap at depths between 4,000 and 5,000 metr 4,267—4,255 m, 4,700 m and 4,872—4,8

6. Distribution of *Chalinura profundicola* n. sp. (●), *Ch. brevibarbis* Goode & Bean (+), *Barathrites iris* Zugmayer (□ = type locality, ■ = Sw. Deep-Sea Exp.), *B. parri* n. sp. (▲), and *B. abyssorum* (◆).

ndicates its being a pronounced deep-
tom-fish.

lrographical conditions.
wo stations at which our expedition ob-
his species the bottom water had a tem-
of +2.42 and +2.45° C. and a salinity
and 35.03 ‰ respectively. For the
l Sars» St. 10 the »probable temperature
given.

graphical distribution (Map,
6). This is, to our present know-
onfined to the East Atlantic deep
om the Bay of Biscay in the north to
22° 30′ in the south.

Chalinura brevibarbis Goode & Bean

(Plate III, figs. 1, 2; Textfig. 6)

Synonyms and Literature:

Chalinura brevibarbis Goode & Bean 1895 p. 413; Jordan, Evermann & Clark 1930 p. 204.

Macrurus (*Chalinura*) *brevibarbis* Murray & Hjort 1912 e. p. (St. 88 and 101); Koefoed 1927 e. p. (St. 88 and 101) p. 105, Pl. v, fig. 10, Textfigs. 36, 37.

Macrurus (*Chalinura*) *simulus* Lütken 1898 p. 27; Ehrenbaum 1902 p. 117 e. p.; Brauer 1906 p. 390 e. p.

When discussing the synonyms of *Ch. simula* GOODE & BEAN and *Ch. profundicola* n. sp. I tried to show that on the one hand the specimens from the »Ingolf» Expedition, identified by LÖTKEN as *Macrurus* (*Chalinura*) *simulus*, in reality belong to *Ch. brevibarbis*, and on the other that one of the specimens taken during the »Michael Sars» Expedition and identified as *Ch. brevibarbis*, that from St. 10, is to be referred to the new species *profundicola*. The list of synonyms of *Ch. brevibarbis* is consequently to be altered as given above.

Of this species no specimens have been taken during the Swedish Deep Sea Expedition, but as the identification of the *Chalinura* species obtained has made it necessary for me to investigate also specimens of *Ch. brevibarbis*, I think it convenient to take it up here. Besides the specimens investigated by me at Copenhagen, I have also been able to study a specimen which the Natural History Museum in Göteborg has obtained by exchange from the U. S. Nat. Museum and which is labelled »North Atlantic south of Cape Sable, Nova Scotia 41° 53' N., 65° 35' W. 858 fathoms Sept. 2, 1883 Albatross».

Ch. brevibarbis is taxonomically re-described in an excellent manner by PARR (1946) to which I therefore refer. From Table V and from the accompanying key to the species of *Chalinura* here treated, its main characteristics and their variability can be seen. It is above all the considerable interorbital width and height of snout together with the short mental barbel that characterize this species.

Bathymetrical distribution. Since it has been proved that the specimen taken by the »Michael Sars» Expedition at St. 10, depth 4,700 m, must be referred to the closely related new species *profundicola*, *Ch. brevibarbis* is to be removed from the species found below 2,000 fathoms, the deepest records being 3,120 m (»Michael Sars» St. 88) and 3,167 m (U. S. »Albatross» St. 2037). The [illegible] west catch mentioned in the literatu[illegible] made by the »Ingolf» Expedition (St. [illegible] depth of 1,668 m, but the specimen o[illegible] in exchange from the U. S. Nat. Mu[illegible] taken at a depth of only 1,569 m. Thes[illegible] metrical range of distribution is conse[illegible] limited to intermediate depths.

Hydrographical condit[illegible] The specimens obtained by the U. S. »Al[illegible] were taken at stations with the temper[illegible] the bottom water varying between [illegible] and 3,89° C. For the three localities w[illegible] specimens of *Ch. brevibarbis* were taken i[illegible] the »Ingolf» Expedition the temperatur[illegible] bottom water varied between +3.0 and [illegible] and for the two »Michael Sars» loca[illegible] probable bottom temperature of [illegible] +3,2° C. is recorded. *Ch. brevibarbis* s[illegible] thus to prefer temperatures somewhat [illegible] than those occuring in depths greater th[illegible] fathoms in the North Atlantic.

Geographical distributio[illegible] Textfig. 6). *Ch. brevibarbis* was first [illegible] on the West Atlantic slope off the [illegible] States, where it seems to occur not unco[illegible] in depths between about 1,500 and 3[illegible] and has also been taken in other part[illegible] North Atlantic or to the north of the [illegible] in waters SE of Greenland and eastw[illegible] far as between Rockall and the H[illegible] Farther southwards along the East [illegible] slope it has however hitherto nev[illegible] captured.

Genus **Lionurus** GÜNTHER

This genus was created by GÜNTHER [illegible] as a subgenus of *Macrourus* and w[illegible] species *filicauda* GÜNTHER as type. [illegible] given the rank of an independent g[illegible] GOODE & BEAN (1895).

In the Macrouroid material obtained [illegible] Swedish Deep-Sea Expedition there a[illegible] specimens which on the whole agr[illegible] well with *Cynomacrurus* [illegible] G[illegible]

This species has been referred to the *Chalinura* by PARR (1946), who points ıat »KOEFOED (1927) first recognized his species has its place among the ers of *Chalinura* (treated by him as a ıus)». KOEFOED's motivation is as fol- »The sub-genus must be *Chalinura*, as eth in the outer row of the upper jaw ıe largest, although this is not very ınced.» On the other hand he under- the strong resemblance with *Lionurus da* (GÜNTHER), »differing, however, from hiefly by the fact that the eyes and arbel are larger.» These differences are, ırse, of no generic value; and it seems to ıat there is a much closer relationship en *carapinus* and *L. filicauda* than bet- the former and the above treated species *linura*. I therefore here prefer to call it *rus carapinus* (GOODE & BEAN).

arding our specimens there are some differences from the descriptions given evious authors, especially KOEFOED (1927) PARR (1946). Unfortunately it was not le for me to obtain for comparison any nen from the type locality, the West tic slope, but I have had the opportunity eing the specimens from the »Michael Expedition, identified by KOEFOED as *urus carapinus* and taken on the Central and between the Canaries and the west coast of Africa. As far as I can , they show, however, the same diffe- s from our material as was deduced from escriptions and moreover regarding some features not mentioned in earlier descrip- I therefore here find it most convenient scribe our material under the name

urus carapinus subsp. **euabyssalis** n. subsp.

(Plate IV, figs. 1—4; Textfigs. 8—10)

Synonyms and Literature of *carapinus* see PARR 1946 p. 68, to which is to be added:

Chalinura carapina PARR 1946 p. 68, Figs 9 (p. 31) and 21.

Material: St. 313 (Haul No. 1), N 29° 48′ W 17° 39′—N 30° 05′ W 17° 18′ June 16th 1948; depth 4,267—4,255 m: 1 specimen.

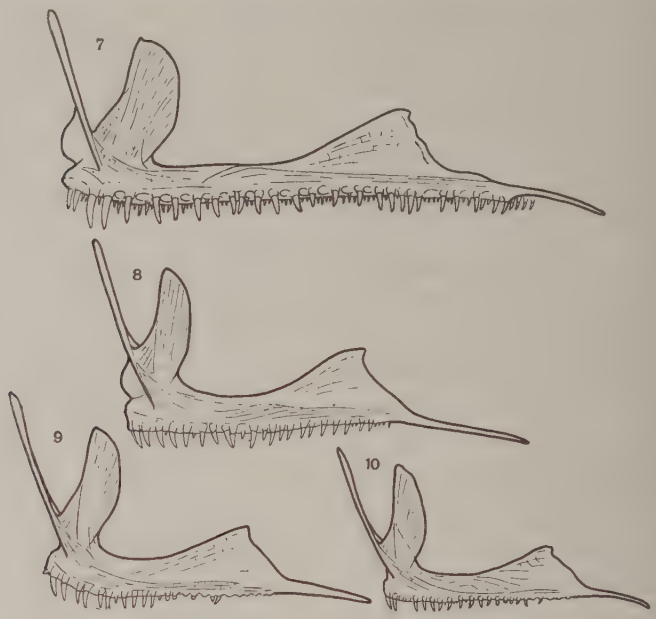
St. 319 (Haul No. 2), N 22° 31′ W 23° 28′—N 22° 41′ W 23° 10′ June 21st 1948; depth 4,872—4,867 m: 1 specimen.

St. 329 (Haul No. 3), N 09° 38′ W 26° 20′—N 09° 50′ W 26° 30′ July 3rd 1948; depth 5,610—5,600 m: 5 specimens (+2 much damaged specimens, probably belonging to this species).

St. 342 (Haul No. 4), N 01° 11′ W 18° 48′—N 00° 58′ W 18° 37′ July 16th 1948; depth 5,250—5,300 m: 1 specimen, type.

All the specimens here referred to as a new subspecies of *Lionurus carapinus* (GOODE & BEAN) for reasons given below, are unfortunately in a more or less bad state, which seems to indicate that specimens of this species, taken at great depths, are more liable to be damaged than those of most other Macrourids living at corresponding depths. The two larger specimens, from St. 319 and St. 342, have a length of 250 and 209 mm respectively, but in both the tail is broken, in that from St. 342 a rather long distance from the tip; in both specimens the eyes are lost and likewise all the scales, the produced ventral rays are cut off close to their base, and the other fins are also more or less damaged. Nevertheless there remain so many features characteristic of this species, that I think the identification must be correct.

The specimen from St. 313 is in such a defective state that it cannot be identified with the aid of the taxonomical features generally used. As it was captured together with four specimens of the new species *Chalinura profundicola* I was at first inclined to believe it to be a small specimen of that species. The presence of a comparatively long barbel (about 3 mm) and of about 11 rays



Textfig. 7—10. Left premaxillary of 7 *Chalinura profundicola* n. sp. from St. 313, × 4; 8 *Lionurus carapinus e*[illegible]*by* n. subsp., type, from St. 342, × 4; 9 *L. c. euabyssalis* from St. 313, × 6; 10 *L. c. euabyssalis* from St. 329, [illegible]

in the ventrals seemed however to contradict this supposition. I therefore tried to find other characteristics, and compared among other things the second branchial arch with that in the two smallest specimens of *Ch. profundicola*. The gill-rakers were however not more or less ridgelike as in this species but tubercular as in the specimen of *L. carapinus euabyssalis* from St. 342, from which the corresponding branchial arch was taken out for comparison. As this latter species has a comparatively long barbel and moreover about 11 ventral fin rays, I have tried to find an osteological feature by means of which *Ch. profundicola* and *L. carapinus* could be distinguished. Setting out from the fact that *Ch. profundicola* has the proportionately longest upper jaw, *L. carapinus* the shortest, I have chosen the premaxillary. As can be seen from Textfig. 7—10 the premaxillaries of the two species are rather unlike and consequently characteristic for each species. The anterior processus, directed obliquely upwards, is proportionately much shorter in *Ch. prof*[illegible] in accordance with the low snout [illegible] species, or only about 31 % of length of horizontal part of the bone against [illegible] 44 % in *L. carapinus euabyssalis*, where [illegible] length of the row of teeth is about [illegible] the same length against about 65 % [illegible] *euabyssalis*. The premaxillary of the [illegible] specimen from St. 313 shows in its [illegible] appearance a close coincidence with [illegible] *L. c. euabyssalis*, the above named rat[illegible] about 53 and 69 % respectively (Te[illegible] Because of this and of the facts m[illegible] above I consider it beyond doubt [illegible] small and defective specimen from St [illegible] longs to the same species as the better [illegible] ones, here identified as *L. c. euabyssal*[illegible]

From St. 329 there are not less th[illegible] small Macrouroids, all in a very b[illegible] Only one of them has the characteri[illegible] duced snout preserved, indicating its [illegible] to *L. c. euabyssalis*, and other features [illegible] this identification as can be seen [illegible]

rements below. In all the other speci- the head is much damaged or almost y lacking and no measurements could uently be taken. But three of them he premaxillaries preserved, and in all ses this bone shows a very good agree- with that of *L. c. euabyssalis* from St. d with that of the small specimen from 3 (one of the bones, with the anterior us about 53 % of length of bone and w of teeth about 70 % of the same is reproduced in Textfig. 10). Moreover ee have the gill rakers on the second ial arch arranged as in the above ned specimen of *L. c. euabyssalis*, as s a comparatively long barbel (about , and two of them have the fin formulae 19 V abt. 11 and D_1 II 8 P abt. 19 V respectively. A fourth specimen is totally all the loose cranial bones but has P V abt. 11 and the second branchial s of the same type as in the others. efore think that there are sufficient to consider them all as belonging to ne species as the other specimens identi- *L. c. euabyssalis*. The remaining two ens are too fragmentary to be identified f them has however V abt. 11), but in their general appearance seems to lict the supposition that they also to *L. c. euabyssalis* (Plate IV, fig. 2).

following measurements as well as the age values given in Table VIII compared ne detailed descriptions given by KOE- 1927) and PARR (1946) seem to prove rrectness of the identification of the reserved specimens. Unfortunately I ad no specimen of *L. carapinus* from st Atlantic for comparison. As to the ements it is to be remarked that some n are somewhat uncertain because of l state of the material; this is especially e for the specimen from St. 329, for the small size has accentuated the ies of making accurate measurements.

	St. 329	St. 319	St. 342
Length snout to anal fin ..	28	63	67
Length isthmus to anus...	—	35	38
Length anterior end of ventral fin base to origin of anal	9.5	20	abt. 20
Length snout to 1st dorsal	21	47.5	49
Length anterior margin of orbital cavity to 1st dorsal	—	39	38
Height of head at the eye	—	19	22
Height of body at the pectorals	—	28	31
Height of body at the 1st dorsal	11	30	34
Length of base of 1st dorsal	6	12	12.5
Distance 1st dorsal to 2nd dorsal	—	18	—
Length of head	19	41	44
Length of snout	6.5	13	15
Width of snout	—	13.5	15
Ventral length of snout ...	3.5	8	9
Horizontal diameter of orbit	3.75	9	9
Interorbital width	6.5	13.5	15
Postorbital part of head ..	—	20	22.5
Length of upper jaw	6	14	15
Length of barbel	abt. 2	6	6.5

It is rather difficult to count the number of fin rays. In the Macrouroids the fin rays are very easily split up into their two components, which makes an accurate counting of the rays difficult in specimens with damaged fins; this is especially the case regarding the paired fins. For the three specimens for which the measurements are given above, I have found D_1 II 7 P abt. 18 V abt. 11 in the specimen from St. 329, D_1 II 9 P 18 V 11 in that from St. 319, and D_1 II 8 P? V 11 in that from St. 342. For *L. carapinus*, GOODE & BEAN give D_1 II 8 V 10, KOEFOED D_1 II 8 P 15—19 V 9—10 and PARR D_1 10 P abt. 18—19 V 11; the values found by me are consequently in good accordance with those found by these authors.

Regarding the measurements given by KOEFOED there is on the whole a good concordance and the same is the case for the percentage values published by PARR (cf. Table VIII), excepting that the upper jaw is said by him to be 38—40 % of length of head against 31.5—abt. 34 % of that length in my speci-

mens. This difference also holds good for a comparison with the specimens from »Michael Sars» investigated by me, in which the length of the upper jaw is 35.5—38 % of length of head. The relative length of the upper jaw seems to increase with increasing size.

Further, the distance snout to 1st dorsal is given as somewhat greater by PARR than by me, 125—130 % of length of head against abt. 110—116 %. In this respect, too, the material from the »Michael Sars» confirms the difference, although not so pronouncedly, as for these specimens the corresponding percentage value varies between abt. 120 and 127 %. Moreover, the length of base of 1st dorsal fin seems throughout to be somewhat greater in my material, abt. 28.5—31.6 % of length of head against 21—26.2 % in the specimen investigated by KOEFOED and abt. 25 % according to PARR.

Regarding the position of the ventral fins the statements in the literature are somewhat contradictory. PARR states the distance from anterior end of ventral fin base to origin of anal as 50—53 % of head against 45—49 % in my larger specimens. KOEFOED has already called attention to the difference in this respect between the »Michael Sars» specimens and the original description: »In one point they differ from GOODE and BEAN's figure (No. 37, pl. XCVII, fig. 339); the position of the ventral fin is in front of the first dorsal, not under its commencement», and a specimen from St. 88 was identified with hesitation with the following motivation: »The ventrals are namely situated before the pectorals below the hindmost part of the gill cover and therefore somewhat before the first dorsal.» This is however in good agreement with Fig. 21 by PARR! In my two larger specimens the ventrals are placed close behind the pectorals, and under the foremost part of the 1st dorsal in that from St. 319, but somewhat more behind the pectorals and under the foremost part of the 1st dorsal in that from St. 342. The relative position of 1st dorsal and ventrals s consequently to be subject to consi variations in this species and this feat not, at least at present be, used taxono

Although I have had no opportu compare my material with specime the type locality, the West Atlanti off the United States, I think it jus for the above named reasons, to identi *Lionurus carapinus* (GOODE & BEAN because of the shorter length of upper j shorter distance snout to 1st dorsal the greater basal length of that fin, I most convenient to regard them as tuting a new subspecies, for which chosen the name *euabyssalis*.

Bathymetrical distrib The specimens taken off the east coas United States by the »Blake», the U. S tross» and the »Atlantis», altogether stations, were all captured in depths 1,211 and 2,654 m. The two stations Atlantic Central Ridge to the south the north of the Azores, where the Sars» Expedition obtained this spec depths of 2,615—2,865 and 3,120 m tively, and the specimen taken by t expedition between the Canary Isla the coast of Africa was trawled at of 2,603 m. Thanks to our investiga now know that *L. carapinus*, repres the new subspecies *euabyssalis*, goes fa down, as our specimens were taken at 4,255, 4,872—4,867, 5,250—5,300 and 5,600 m. Curiously enough it has n taken at depths between 3,120 and in spite of the fact that rather many d and trawlings have been carried out depths. This seems to support my that the deepest-living specimens of *pinus* constitute a subspecies of th belonging to the deepest-living Te hitherto known.

Hydrographical condi At 24 of the 28 stations at which the »B

xtfig. 11. Distribution of *Lionurus carapinus* (Goode & Bean) (+), and *L. c. euabyssalis* n. subsp. (●).

S. »Albatross» obtained *L. carapinus* and
ature measurements have been published
nperature of the bottom water varied
n +2.95 and +3.89° C; in the other four
he temperature is said to be +4.44,
and +7.22° C (2 stations). For the
l Sars» St. 88 to the north of the Azores
obable temp. 2° 5» is recorded. The
water at the stations of the Swedish
ea Expedition at which specimens identi-
belonging to the subsp. *euabyssalis* were
had temperatures of +2.42, +2.45,
and +2.28° C respectively. The main
seems consequently to be rather eury-
therm, whereas the subsp. *euabyssalis* may be coldwater-stenotherm.

As to the salinity the values for our stations were 34.89, 35.03, 34.80 and 34.85 ‰ respectively. No other values seem to be published.

Geographical distribution (Map, Textfig. 11). *L. carapinus* has hitherto been recorded only from the North Atlantic but seems there to have a wide distribution as it occurs on both sides of the Ocean as well as on the Central Ridge. In the western parts it seems to be rather common down to abt. 2,650 m; Goode & Bean give 30 localities from the »Blake» and the U. S. »Albatross»

investigations between about N 35° to 42° and W 65° to 75° (two stations, designated as 2094 and 2194, have the same position and the same depth and are therefore probably referable to one and the same station, St. 2194). The four stations published by SCHROEDER (1940) are situated within the same area. Therefore it is rather striking that it has never been taken at greater depths in the West Atlantic deep basin. In the Mid-Atlantic it has been taken only twice, to the south as well as to the north of the Azores. In the Eastern Atlantic curiously enough it was never recorded from the close investigations during the French and Monaco cruises, and only taken once during the »Michael Sars» Expedition, between the Canaries and the northwest coast of Africa. According to the results from the trawlings during the Swedish Deep-Sea Expedition, the subsp. *euabyssalis* has however proved to be rather common in the East Atlantic deep basin from the Canaries to the equator, as it was taken at all our four stations there.

Genus **Echinomacrurus** ROULE

Echinomacrurus mollis ROULE

(Plate I, fig. 2; Textfig. 5)

Synonyms and Literature:

Cetonurus microps VAILLANT in RICHARD 1905 p. 3 (*nomen nudum*); GILBERT & HUBBS 1917 p. 146; FOWLER 1936 p. 468 (position and depth of station not correct).

Echinomacrurus mollis ROULE 1916 p. 22; 1919 p. 84, Pl. IV, Figs 2 and 2 a.

ROULE was at first in doubt about the specimen on which VAILLANT had founded his *Cetonurus microps*, and therefore proposed a new name for the species described by him; in a footnote (p. 84) he states that according to RICHARD both *Cetonurus microps* and *Echinomacrurus mollis* are founded on one and the same specimen. *C. microps* is thus verified by the type specimen, but as it is a pure *nomen nudum* I think it is not necessary to take up this name again; I consequently reta name under which the species was de and figured for the first time.

Material: St. 401 (Haul No. 14), N W 18° 45′—N 43° 24′ W 18° 59′, Sep 1948; depth 5,000—5,025 m: 2 spe

The two specimens obtained duri Swedish Deep-Sea Expedition seemed sight to agree very little with the sp described and figured by ROULE (1919) *nomacrurus mollis*, above all regarding t of the snout. But a direct comparison, lu my stay in Monaco, between the type spe of this species and one of our specim convinced me that they are identica species. The differences in the general ap ance seem to be referable to shrinkage type specimen, and this is confirmed by annotation on the label giving the info that the specimen was first fixed in f and afterwards transferred into alcoh cause of this procedure, the snout al has become shrunk and somewhat point this seems to have been further accentu the painting Fig. 2, Pl. IV by ROULE w was apparently drawn from the specim it had been transferred into alcohol, h the measurements published by ROU probably taken from the specimen w in formalin. As a consequence most measurements taken by me on the type s are smaller than those given by ROUL all those for the height of body. In the I therefore give for the type specimen the measurements taken by me but th by ROULE also.

In percentages of length of head obtains for the proportions generally PARR for the Macrouroids the values Table X.

Taking into consideration the ineq size and the difference in mode of tion between the type specimen of R the two specimens taken during ou

there are in my opinion no differences in alues given in the table of such an im- nce that they contradict an identification r specimens with *E. mollis*. On the other there are a lot of small similarities which ly speak in favour of such an identifica- above all the curious appearance of the nation. I am consequently fully convinced the specimens taken by us really belong e species *E. mollis*.

th the aid of the specimens obtained by ome taxonomical particularities of this is species can be added to the original ption.

e most striking feature of freshly cap- specimens of *E. mollis* is the large, semi- parent, almost gelatinous head with its led, blunt snout, its small dark lateral and its thickened gill-covers, the hind- r of which has an angular incision below erculum. The small mouth on the ventral e of the head can be protruded quite lerably. The anal opening is surrounded scaleless area, extending backwards to the fin; in both specimens the anus is pro- d. The squamation consists, as already ed out by ROULE, of small spinigerous in the skin, all well separated from each and giving the surface of the fish a furry re as described for *Trachonurus sulcatus* (GOODE & BEAN). In size they are rather ble, the largest being found on the oper- and the belly and along the back and ides of the body; along each side of the of the 2nd dorsal the knobs are a little than the others, especially on one of pecimens, thus somewhat reminding one rows of enlarged scales along the base 2nd dorsal in *Cetonurus globiceps* (VAIL- . Apart from the opercules the surface of ead is covered with smaller knobs, which omewhat larger only on the tip of the but without constituting a spiny scute; e rami of the lower jaw the knobs are small. Besides the naked area around the anus there is also a small area behind the 1st dorsal, as well as rounded areas behind the base of the pectorals and the ventrals, without knobs, no doubt to prevent the fins from being injured by the spines when laid down against the skin; in one specimen the naked areas behind the ventrals are confluent with that around the anus. Moreover a small stripe along the median ventral line of the snout, the area around the jaws, the whole gular region between the rami of the lower jaw and the branchiostegal membrane are quite scale- less. On the tail the scale-covering disappears at a distance of about 335 mm from tip of snout; behind that level it seems as if the knobs had been lost by injury, but as the limit occurs exactly at the same level in both specimens there is reason, I think, to suppose that the hind part of the tail is in fact naked in this species.

Unfortunately all fin rays are broken, and therefore very little can be said about their size. In one of the specimens the filaments of the produced 1st ventral rays are present; they reach however only to the origin of the anal fin and are thus shorter than the shortest ventral ray in the figure given by ROULE. Perhaps the filaments in our specimen are not preserved in their entire length; it appears to me however that all fins seem to have been reconstructed too large in the figure mentioned, but this of course could only be established from quite undamaged specimens. The 1st dorsal in our specimens has 12 rays, the first a very short spine easily overlooked, the second a slender, smooth spine. ROULE found in the type specimen only 8 rays, but I have counted 11; the first very small spine and the two last rays have obviously been overlooked by him. The number of pectoral rays is very difficult to state, but I have counted about 17/16 and 17/17 respectively; ROULE gives their number as 13, but I have counted 16. The ventrals in all three specimens have 9 rays according to my counts against 8 by ROULE for the type.

The colour of the freshly captured specimens was a light brownish to olivaceous green, with the naked areas around the jaws, the gular and branchiostegal regions dark bluish; the opercular and abdominal cavity regions were very dark also, because of the black gill cavity and peritoneum. After some time of preservation the greenish colour has disappeared, only a brownish pigment remaining in the skin over the knob-like scales on upper parts of the body and on the tail; the narrow scaleless median stripe on the ventral surface of the snout is likewise brownish. The naked hindmost part of the tail is completely without pigment. Regarding the colour of the type specimen ROULE gives the following information: »La note de couleur prise sur l'individu frais montre un corps gris-brunâtre ou gris-jaunâtre pourpré, de teinte uniforme assez claire, sauf dans la partie ovalaire antérieure, où les parties viscérales vues par transparence à travers les téguments donnent une coloration complémentaire d'un violet plus ou moins foncé. Les nageoires sont de teinte gris-bleuâtre ou gris-jaunâtre clair, avec rayons un peu plus foncés que la membrane interradiale.»

Bathymetrical distribution. The type specimen of *E. mollis* was taken in the »Monaco deep» at a depth of 5.413 m. The two specimens obtained by our expedition were captured at a depth of 5,000—5,025 m. According to our present limited knowledge it seems consequently as if this curious species is confined to very great depths.

Hydrographical conditions. About this there is no information concerning the type specimen. At the station (St. 401) at which our specimens were captured, no bottom water sample was taken, but at St. 400 the water had a temperature of +2.71° C and a salinity of 34.93 ‰ at about the corresponding depth, 4,880 metres.

Geographical distribution (Map, Textfig. 5). The position of the station at which the type specimen was taken (»Princesse-Alice» St. 1787) was N 31° 07′ W 24° 03′ (specimens were also found to the east Central Ridge, but more northward, at N 4° W 18° 45′.

Family BROTULIDAE

The family Brotulidae is one of the adaptive teleostean groups from an eco point of view. Probably being originall rine shore fishes they have adapted them to a life along the bottom down to the gr depths at which fishes on the whole hav found, constituting the dominating tele family at depths greater than 3,660 m fathoms), and besides this they hav migrated into subterranean caves, conseq into two very extreme biotopes which h is true, many peculiarities in common, instance darkness and minimum of foo FAGE 1954). They have, however, as altered only very little, the most s adaptations to the extreme conditions being reduction of the eyes and the pig tion, and constitute on the whole a homogeneous group taxonomically. Bec this our knowledge of the systematical a ment of their genera and even of many remains unsatisfactory, although very v attempts have been made by SMITH & CLIFFE (RADCLIFFE 1913) and especia NORMAN (1939). Above all regarding th sea species the scant number of sp (many species are hitherto known onl single specimen) renders us unacquainte the range of variation within the various and their often more or less bad stat captured makes the descriptions rath and not very instructive for the identi of new finds. I have therefore tried to f further features and especially such as used also for specimens more or less da

The number and shape of gill-rakers 1st branchial arch seem to fill this dem least to some extent. My own experie a hitherto rather limited material, it

s in the direction that the shape of the anchial arch is, as a rule, rather character- of the genera and in some cases, as for ce in *Lamprogrammus*, even of the species a genus (see below, p. 306). Regarding ecimens identified as *Bassozetus taenia*, are some extremely damaged specimens, pposed belonging of which to this species be verified only with the aid of the 1st hial arch (see below, p. 284). I have there- iven drawings of this arch (that from the de has been chosen) for all species treated and, if possible, of more than a single nen in order to give an idea of the indivi- variation, which, of course, exists and must be considered as far as possible. to be hoped that future investigators of mily will contribute to an analysis of the lids in this respect so that the taxonomic of this feature can be tried on a suffi- y large material.

ther feature which regarding the genus *gigas* and allied genera has proved to be lue taxonomically is the pattern of dent- is patches on vomer, palatines and basi- hials. It seems to me possible that a more ed analysis of these features than hitherto e of value also in other cases.

the foregoing I have called attention to ct that the Brotulids are very adaptive rious biotopes. It is therefore remarkable they have not to a greater extent gone to a pelagic mode of life. At least until ly they have been considered as through- rue bottom fishes as adults; larvae and ; fish stages are, however, repeatedly in upper water layers. Now we have got edge of several catches also of adult lids in pelagic nets. In the following I mention some specimens of *Lamprogram-* aken in this manner, and it seems to me likely that the members of this genus, at to some extent, normally live pelagically elow, p. 307). The same seems to be the with the members of the genus *Barathro-*

nus, semi-transparent fishes with an upward-directed mouth. Most of the known specimens have admittedly been captured in trawls of various kinds, but according to LEGENDRE (1934) at least one specimen has been found among the stomach contents of an albacore (*Germo alalunga*), a species which seeks its food among pelagic organisms in the upper water layers, and this, together with the just mentioned general shape of the *Barathronus* species, makes it most likely to me that they must be considered as pelagic fishes (see NYBELIN 1954). As to *Neobythites phyllosoma*, *Barathrodemus microps* and *Brotulotaenia nigra*, described by PARR (1933) from pelagic hauls, they seem to be, at least partly, post-larval or young stages; they are, moreover, hitherto but little known and of minor interest in this connection. On the other hand large specimens of Brotulids belonging to typically bottom-dwelling deep-sea types have occasionally been taken in pelagic nets. It seems consequently as if even these types may occasionally seek upper water layers; perhaps the females of the viviparous species regularly swim up in intermediate or upper water layers in order to bring forth their young (NYBELIN 1954). If this be the case, they must of course nevertheless be regarded as true bottom-fishes. On this occasion, in treating the bottom-fishes of the Swedish Deep-Sea Expedition, I have found it convenient to treat all the Brotulid species taken during the expedition, whether they are true bottom-fishes or not.

Regarding the systematical arrangement of the genera within the family Brotulidae, a subdivision has been attempted by SMITH & RADCLIFFE (RADCLIFFE 1913), who have created the following subfamilies: Sirembinae, Brotulinae, Neobythitinae, Bythitinae and Hephthocarinae. The material of Brotulids obtained during the Swedish Deep-Sea Expedition does not give rise to any discussion in this respect as it only contains members of one of these subfamilies, the Neobythitinae. Besides

these, however, it containes some species belonging to an apparently natural group not considered in the subdivision proposed by SMITH & RADCLIFFE, consisting of the genera *Aphyonus* GÜNTHER, *Sciadonus* GARMAN, *Barathronus* GOODE & BEAN and *Leucochlamys* ZUGMAYER. When creating the last named genus, ZUGMAYER (1911) was in doubt if these genera could be ascribed to the family Brotulidae or if they should not rather be placed in a separate family, Aphyonidae, and NORMAN (1939, p. 83 note) seems also to be in some doubt about their true systematic position. For a definite solution of this question we need much more information regarding the anatomy and taxonomy of these little known species as well as of the Brotulids in general. Because of this I propose as a provisional arrangement to maintain them for the present as a subfamily Aphyoninae within the family Brotulidae.

Genus **Barathrites** ZUGMAYER

Barathrites iris ZUGMAYER

(Plate V, fig. 2; Textfigs. 6, 12)

Synonyms and Literature:

Barathrites iris ZUGMAYER 1911 a, p. 11; 1911 b, p. 132, Pl. VI, fig. 3. non PARR 1933 p. 46.

Material: St. 363 (Haul No. 8), N 12° 22′ W 52° 00′—N 12° 13′ W 51° 44′, Aug. 3rd 1948; depth 5,044—5,033 m: 1 specimen.

The specimen in question is in a rather good state of preservation; the pectorals are, however, much damaged and also the caudal, and in addition the skin along the anterior part of the dorsal as well as of the anal has ruptured; all scales have been lost.

My identification of this species is based on a direct comparison with all the three *Barathrites* specimens hitherto known. I had the opportunity to study the type specimens of *B. iris* ZUGMAYER and *B. abyssorum* ROULE during my stay at Monaco in 1949, and the specimen described by PARR (1933) as *B. iris* has kindly been placed at my disposal as a loan for comparison from the Bingham Oce graphic Laboratory, New Haven, U. SA. Table XI I have plotted together my mea ments and counts; some of them diverg little from those in the original descripti of the two named species, which at least par is because of shrinkage since the specimen w transferred from formalin to alcohol.

As can be seen from the table, the f specimens are rather uniform in their ene appearance. The specimen obtained dur g t Swedish Deep-Sea Expedition agrees hav much more with the type specimen of *B. i* than do the two others, and there can, I thin be no doubt that our specimen belongs to *B. ir*

Regarding the number of rays in the f there is also a good agreement between I fo specimens; the numbers given in Table X re to my own counts, ZUGMAYER gives for *B. i* the number of dorsal fin rays as about 15, anal rays abt. 85, PARR 112—115 for the lots and 85 for the anal fin and ROULE 115 or t dorsal and 85 for the anal in his *B. abyssoru* As in many other Brotulid genera thes num bers seem to be of little value from a taxo nom point of view.

The gill-rakers on the 1st branchial ch the left side (Textfig. 12 a—b) are four in t epibranchial piece, that nearest the ang. bein nearly as large as the largest on the lowe pa of the arch, which has only five tone-lik rakers and anterior to them six rudim ntar rakers in the form of dentigerous pat hes variable size. As compared with those oth Brotulids investigated by me the »long rake are remarkably short and the »short rake seem to be considerably reduced. For the typ specimen of *B. iris* I have only no d th number of the gill-rakers, 4+6+6, whi is i good agreement with our specimen, t un fortunately nothing about their shape a l siz

Our preserved specimen, which lo s a scales, is quite colourless and semi-tran aren the gill cavity is, however, brownish an so also the ventral fins; the peritoneum bla

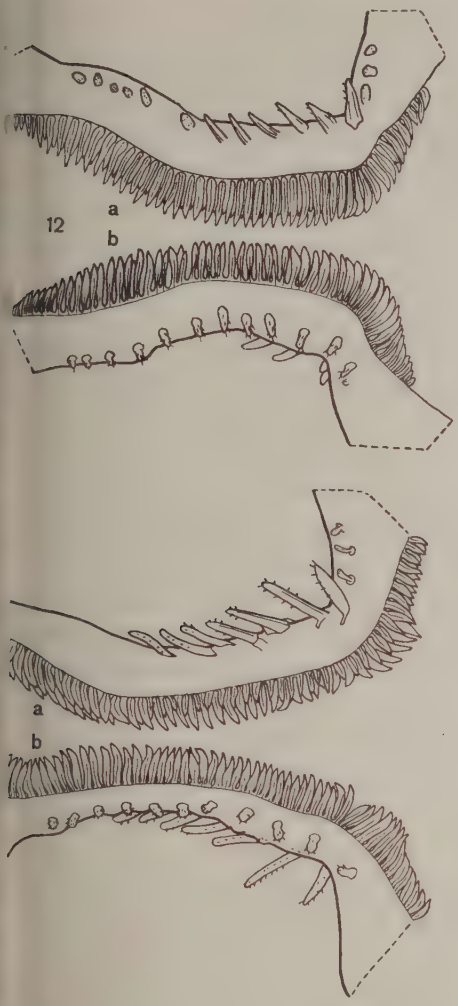


Fig. 12—13. 1st left branchial arch of 12 *Barathrites* UGMAYER (specimen from the Sw. Deep-Sea Exp.), 3 *B. parri* n. sp., a from the outer side, b from the inner side. All figures × 4.

Bathymetrical distribution. The type specimen of *B. iris* was taken at a depth of 3,465 m. As it was captured in a trap («nasse triangulaire») placed on the bottom there can be no doubt that this species is a true bottom fish. Our specimen was trawled at a depth of between 5,044 and 5,033 m, thus considerably deeper.

Hydrographical conditions. Regarding the type specimen no data in this respect are given. As to our specimen no hydrographical observations were made on the station at which it was captured, but at the neighbouring St. 362 (N 11° 45′ W 51° 29′, depth 4,975 m) the bottom water had a temperature of +1.65° C. and a salinity of 34.83 ‰.

Geographical distribution. (Map, Textfig. 6). The type specimen was taken on the western slope of the Central Ridge (N 31° 44′ 30″ W 42° 39′), our specimen west of that Ridge in the western deep area but much more southward. The species has hitherto not been found in the eastern deep area of the North Atlantic.

Barathrites parri n. sp.

(Plate V, fig. 1; Textfigs. 6, 13)

Synonym and Literature:

Barathrites iris PARR 1933 p. 46.

As already mentioned by PARR the specimen described by him as belonging to *B. iris* differs in some respects from the type specimen; the height of the body is greater, even greater than in *B. abyssorum*, which differs from *B. iris* mainly in this respect, and has moreover somewhat greater length of head and horizontal diameter of eye and somewhat narrower interorbital width. My own study of this specimen has only confirmed this and as a further difference may be added a greater length of the distance snout to dorsal fin (see Table XI). Contrary to PARR, who had no opportunity to see the type specimen, I cannot identify his specimen with *B. iris*, the less so as the new specimen taken during the Swedish Deep-Sea Expedition gives us a better idea of the range of variation within this species. On the other hand it cannot be identified with *B. abyssorum*, with which it agrees in the greater depth of body, because of the much narrower interorbital width, only abt. 30 % of length of head against abt. 45 % in *B. abyssorum*. Finally it may be noted that the lower part of the 1st branchial arch on the left side lacks every trace of rudimentary gill-rakers (Textfig. 13 a); on the right side the formula is 4+5+2, one of

the last two seeming to correspond to the sixth (anterior) »long» raker on the left side and the other to the largest, foremost patch in *B. iris* (see Textfig. 12 a); there is consequently a large space between these two patches. If this feature is not only an individual abnormality but a further stage in the reduction of the anterior rakers on the lower part of the arch, as already indicated in *B. iris*, we here have a good differential characteristic between this proposed new species and the two other species of the genus *Barathrites*. It is also worth noting that the specimen described by PARR was taken much shallower than the two other species as it was captured at a depth of only 1,647—1,747 metres.

For the three *Barathrites* species here distinguished I give the following p r e l i m i n a r y key:

I. Height of body at anus less than 17 %, length snout to dorsal less than 20 % of body length; diameter of eye less than 12 % of length of head *B. iris* ZUGMAYER

II. Height of body at anus more than 17 %, length snout to dorsal more than 20 % of body length; diameter of eye more than 12 % of length of head

A. Interorbital width abt. 45 % of length of head, length snout to anal less than 40 % of body length *B. abyssorum* ROULE

B. Interorbital width abt. 30 % of length of head, length snout to anal more than 45 % of body length *B. parri* n. sp.

Genus **Bassozetus** GILL

Bassozetus taenia (GÜNTHER)

(Plate VI, fig. 1; Textfigs. 5, 14—18)

S y n o n y m s and L i t e r a t u r e:

Bathyonus taenia GÜNTHER 1887 p. 110, Pl. XXIII Fig. A; *Bassozetus taenia* GOODE & BEAN 1895 p. 323; JORDAN & EVERMANN 1898 p. 2510; ? ROULE 1935 p. 6.

M a t e r i a l: St. 329 (Haul No. 3), N 0[illegible] W 26° 20′—N 09° 50′ W 26° 30′, July 3[illegible] 1948; depth 5,610—5,600 m: 2 speci[illegible] (one very defective).

St. 363 (Haul No. 8), N 12° 22′ W 52 [illegible] N 12° 13′ W 51° 44′, Aug. 3rd 1948; dep[illegible] 5,044—5,033 m: 4 specimens (two [illegible] defective).

These six specimens I have identifi[illegible] as belonging to *Bassozetus taenia* (GÜNTHER). Three of them were very much damag[illegible] in the trawl, which may easily happen as the skin is very loosely attached to the bo[illegible] in this species. The general appearance, the number of gill-rakers, when present, and [illegible] osteologic particularities speak, however, in favour of my opinion, and as they were caught together with more or less undamaged specimens, the identification, even if not accurate, cannot cause any errors as to the geographical and bathymetrical distribution of the species. The larger specimen from St. 363, which is in an excellent condition (Plate VI, fig. 1), I had the opportunity to compare directly with GÜNTHER's type specimen in the British Museum (Nat. Hist.), and have found a very great coincidence between them, the only difference being that the type, because of its preservation in alcohol, is somewhat shrunken and consequently more slender. Unfortunately I took only some few measurements from the type specimen during my visit to London, but thanks to the kindness of Dr. E. TREWAVAS I have got them supplemented with all regarding total and body length and greatest height of body and also with numbers for the pectoral fin rays and the gill-rakers. All measurements have been compiled from the excellent figure given by GÜNTHER; the latter are in Table XII put in brackets.

Bassozetus oncerocephalus (VAILLANT). I had the opportunity to see in Paris, [illegible] to be closely related to *B. taenia*, and because of this I have added some measure[illegible]

by me of the type and single specimen ble XII of the measurements of *B. taenia*, and of the specimens caught by the sh Deep-Sea Expedition, as far as the of the material has allowed it. For of the characters also the percentage are given in Table XII.

rt from some minor variations according e and mode of preservation there is quently a good agreement between the specimen of *B. taenia* and the specimens ed during our expedition.

the above mentioned characteristics other particularities may be added.

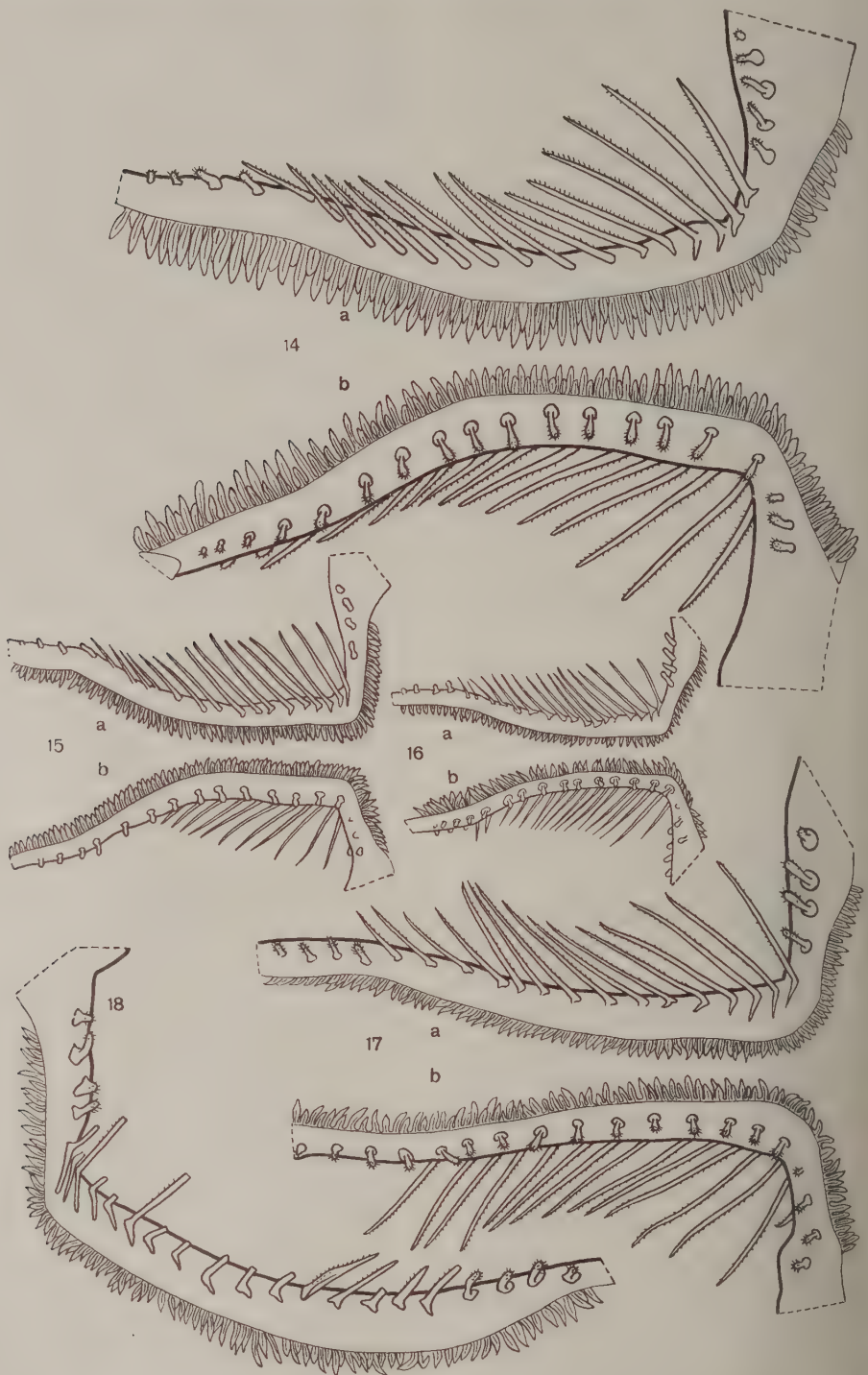
eyes are in all specimens very small ot easy to measure; in the larger specimen St. 363 the lens has a diameter of abt. m, the eyeball of abt. 2 mm, in the type hen the diameter of the lens is abt. 1.4 m It is impossible to measure the interor- width exactly, because of the loose which also causes the notch above the o be less pronounced in my specimen in the type.

Regarding the number of fin rays GÜNTHER the following values for his specimen: A 115 P 30, whereas the larger specimen St. 363 has D 128 A 106 P 27/27 and naller from the same station D 124 A 103 25. In the other specimens the fins amaged or lost except for the pectorals smaller specimen from St. 329, which 27/27 rays. At my request Dr. TREWA- as re-examined the type concerning the er of pectoral rays and has found them 25/28, thus in good agreement with the found by me on our material. There is quently a probability that the values by GÜNTHER for the dorsal and anal are too high. In all our three better ved specimens the caudal fin has 8 rays. number, size and arrangement of the kers on the 1st branchial arch (Textfigs. –8) also show a good coincidence between ve specimens in our material which could be investigated in this respect and the type of *B. taenia*, whereas *B. oncerocephalus* shows lower values for the short rakers on the lower part of the arch (Table XIII).

Regarding the colour GÜNTHER says: »Light-coloured (possibly pink in life), with the head and abdomen black.» Our largest specimen shows a light brownish colour on the transparent skin of trunk and foremost half of the tail, fading backward, and with the random of each scale pocket (all scales are lost) darker brownish; peritoneum blackish, translucent; head brownish, lighter above, jaws and operculum darker. The smaller specimen from the same station shows the same coloration, whereas that from St. 329, the smallest with the skin preserved, is somewhat darker on the body and with the head more greyish brown.

As mentioned above, *B. oncerocephalus* shows many similarities with *B. taenia*, but differs from it, as can be seen from Table XII, above all in the greater space between ventrals and anus (abt. 22 % of body length against abt. 16—17 % in *B. taenia*) and in the much shorter ventrals (abt. 10 % in body length, 46 % in length ventrals to anus against abt. 14—15 and abt. 86—95 % respectively in *B. taenia*). The number of pectoral rays is according to VAILLANT 21, I myself have counted 22/25 or slightly fewer than in *B. taenia*. The number of dorsal rays, not given by VALLANT and very difficult to count, seems to be higher than in *B. taenia* or approximately 150. As stated above there is also a small difference in the number of gill-rakers. *B. oncerocephalus* must consequently be regarded as a distinct species compared with *B. taenia*. Of other *Bassozetus* species *B. glutinosus* (ALCOCK) seems to come very near to *B. oncerocephalus*.

Bathymetrical distribution. The type specimen was taken at the »Challenger» St. 104 at a depth of 4,575 m, our specimens at 5,610—5,600 (St. 329) and 5,044—5,033 m (St. 363), thus considerably deeper. These



Textfig. 14–18. 1st branchial arch of *Bassozetus taenia* GÜNTHER; 14 St. 363: 1, 15 St. 363: 2, 16 St. 329: 1, 17 St. [illegible] and 18 St. 363: 3. Figs. 14–17 left arch, a from the outer side, b from the inner side, fig. 18 right arch from the [illegible] side. All figures × 5.

lata consequently do not contradict ıER's opinion of this species as an »emin- athybial fish». It is therefore somewhat hing that ROULE (1935) mentions *B.* as »capturé par la Camera de lobos» her shallow water at Madeira. This cation, I think, needs confirmation.

drographical conditions. e type locality of *B. taenia* a bottom ature of +2.56° C. is given. At our we found a bottom temperature of C., at St. 362 (quite near the trawling) +1.65° C. The values for the salinity re 4.87 ‰ and 34.83 ‰ respectively.

Geographical distribution (Map, xt. 5). *B. taenia* was hitherto known only m the »Challenger» St. 104 at N 02° 25′ 0′, situated in the eastern basin of the rtl Atlantic immediately north of the nti Ridge near the supposed Romanche p. Our St. 329 lies to the northwest of that tic, at N 09° 38′ W 26° 20′, likewise east th Central Ridge, St. 363, however, west it at N 12° 22′ W 52° 00′. According to r esent knowledge this species is thus nfin d to the North Atlantic, occurring on th des of the Central Ridge.

If ıe identification by ROULE (1935) be rre (cf. above under Bathymetrical distri- tio the species occurs also at Madeira.

enus **Porogadus** GOODE & BEAN

The genus *Porogadus* GOODE & BEAN, as nite by NORMAN (1939) and other modern , contains more species than any her rotulid genus, their number being 15. ttempts have been made to split up nus into smaller units, but most of nnot, as pointed out by NORMAN, be d as valid. Regarding the genus *Peno-* posed by GOODE & BEAN, however, : »It is possible that *Penopus* should a distinct genus, but there are few characters to distinguish it from *Porogadus*. *Sirembo microphthalmus*, Vaillant, appears to be closely related to *Penopus macdonaldi* GOODE & BEAN.»

During my visit to Paris I had the opportunity to study the three specimens, including the type, of *Sirembo microphthalmus* and I have found them to correspond very closely to the description and figure of *Penopus macdonaldi* as given by GOODE & BEAN. The four spines at the angle of the preoperculum are very conspicuous as also is the curved opercular spine. The ventrals consist each of a single filament, probably composed of two rays, united in their whole length. The only difference of importance between the two species, judging from the description and figure given by GOODE & BEAN, seems to be the greater length of the maxilla in *microphthalmus*. These two apparently distinct species constitute a group of their own, distinguished from all other members of *Porogadus* in the following characters, *inter alia:*

Opercular spine strong and curved; four spines at angle of preoperculum; snout projecting; dorsal beginning above middle of pectorals; ventrals each consisting of a single filament.

Whether one should give these two species the rank of a distinct genus or only of a subgenus within *Porogadus* may be a matter of opinion.

The remaining 13 species described are fairly uniform. I agree with NORMAN's opinion that the supposed absence of the three lateral lines in some species is due to a poor state of preservation, and further that the difference between a single or a bifid pelvic ray is a feature of comparatively little importance, which can by no means be used alone as a generic character. Regarding the presence or absence of spines on the head the same can be said to some degree. In this question it must be taken into consideration that the spines seem to be more strongly developed in younger specimens than in adults. I find this character of some value, however, for dividing

the *Porogadus* species into groups for practical purposes, which does not mean that I consider these groups as natural subgenera.

The species with strongly developed spines on the head are: *Porogadus miles* GOODE & BEAN (type of *Porogadus*), *nudus* VAILLANT (type of genus *Celema* GOODE & BEAN), *trichiurus* (ALCOCK) (type of genus *Dermatorus* ALCOCK), and *melanocephalus* (ALCOCK). A somewhat weaker development of the spines on the head is found in: *subarmatus* VAILLANT, *melampeplus* (ALCOCK), and *güntheri* JORDAN & FOWLER. Very poorly developed head spines are characteristic of: *gracilis* (GÜNTHER) (type of genus *Moebia* GOODE & BEAN), *catena* (GOODE & BEAN) (type of genus *Bathyonus* GOODE & BEAN), *longiceps* GARMAN, *atripectus* GARMAN, *breviceps* GARMAN and *promelas* GILBERT.

During the Swedish Deep-Sea Expedition we got a specimen of *Porogadus*, which, for reasons given below, I will describe as a new species under the name

Porogadus abyssalis n. sp.

(Plate VI, figs. 2—4; Textfig. 19)

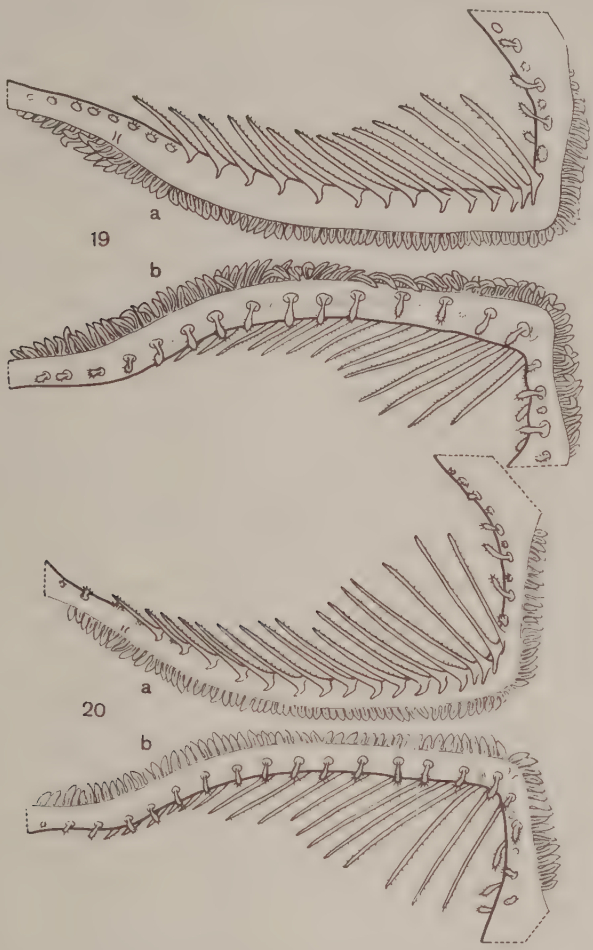
Material: St. 342 (Haul No. 4), N 01° 03′ W 18° 40′—N 00° 58′ W 18° 37′, July 16th 1948; depth 5,250—5,300 m: 1 specimen.

The specimen, which is rather well preserved, has a total length of 218 mm; other measurements in mm are:

Length of body	209
Greatest height	21
Length snout to dorsal	41
Length snout to anus	66
Length snout to anal	71
Length base of ventrals to anus	35.5
Length of outer ventral ray	29
Length of inner ventral ray	22
Length of undivided basal portion	2.5
Height of head at angular process of lower jaw	18
Length of head	
Length of snout	
Length snout to hindborder of maxilla	
Length snout to upper edge of preoperculum	
Length of lower jaw from symphysis to angular process	
Diameter of eye	
Interorbital width	
Number of rays in D	
Number of rays in A	
Number of rays in P	

The spines on the head are poorly de and mostly hidden under the skin. The est spine is that at the hindborder posterior nostril. Two small spines are s on the crest between the orbit and n of head on the interorbital space, tw spinelets above the upper hindborder orbit and two on the postorbital cre anterior of them more than halfway bac the crest, the posterior at its ending at most part of preoperculum. The op spine is flat and weakly developed, th border of preoperculum is smooth.

The arrangement of the gill-rakers on branchial arch of the left side (Textf seems to be as follows: on the epibr piece there are 3 short rakers, flanked small dentigerous patches, and more long raker near the joint, then a long r the joint between the epibranchial and branchial pieces, followed on the branchial piece by 12 long rakers, de in length forwards, and before then short, knob-like rakers and finally five short, knob-like rakers on the hypob piece. As the exact position of the ra the *Porogadus* species is not easy to de on gill-arches not isolated by dissec have for practical purpose in Table XIV them as belonging to three groups: rakers on the epibranchial piece, 2. long and 3. short rakers on the cerato- an



Figs. 19—20. 1st left branchial arch of 19 *Porogadus abyssalis* n. sp. and 20 *P. subarmatus* VAILLANT, a from the outer side, b from the inner side. × 4.

al pieces. For this species we conse- have the gill-raker formula 3+14+8. colour of the preserved specimen is: arker brownish, darkest on the oper- ap; trunk and anterior half of the tail eyish brown with a bluish tinge, fading rds; belly bluish; posterior half of tail colourless. When freshly captured, the were only a little darker. All scales ; the randoms of the scale pockets are h, perhaps indicating that the colour was more pronouncedly brownish on y. Markings of the three lateral lines, ly of the subventral one, are clearly (Pl. VI Fig. 2, 3).

Bathymetrical distribution. *Porogadus abyssalis* was taken at a depth of 5,250—5,300 m. This is the deepest catch of a *Porogadus* hitherto made, as all previously known species of the genus have been obtained at depths shallower than 3,300 m.

Hydrographical conditions. The temperature of the bottom water (7 m above bottom) at the station at which *P. abyssalis* was captured was +2.28° C. and the salinity 34.85 ‰.

Geographical distribution. As only the type specimen of this species is known it can only be stated that St. 342, on which it was taken, lies immediately to the north of

the Romanche Deep in the southernmost part of the North Atlantic.

The specimen described above as *Porogadus abyssalis* n. sp. has to be compared with the species belonging to the above mentioned group with only very poorly developed head spines. It must however be pointed out that this comparison offers many difficulties because of the fact that the existing descriptions are not easily comparable with each other. The only species of this group which I have had the opportunity to study myself is *P. gracilis* (GÜNTHER). I think it very probable that the number of species in this group would be reduced if someone had the opportunity to undertake a direct comparison between specimens of all species described and moreover to obtain further material, which might give an idea of the range of variation within the species.

An identification of *P. abyssalis* with *P. catena* (GOODE & BEAN) is out of question because of the small head in the latter species, going $8\frac{2}{3}$ times into body length against 6 in our specimen and of the slender body, the height of which is going $12\frac{1}{2}$ times into body length against $10\frac{3}{5}$ in *abyssalis*. *P. longiceps* GARMAN, which has the same length of head in relation to body length as *abyssalis*, has a relatively much smaller eye, going abt. $2\frac{1}{2}$ times into length of snout, abt. 8 times in length of head against $2\frac{1}{5}$ into snout length, 7 times into length of head in our specimen. In *P. gracilis* the length of head is abt. 7 times into body length, the eye is going abt. 2 times into length of snout, 6 times in length of head; moreover the number of long gill-rakers on 1st branchial arch is greater in *gracilis*, according to my counts 4 short rakers on the upper part, 17 (18?) long rakers and abt. 3 rudimentary rakers on the lower part against 3, 14 and 7 respectively in *abyssalis*. The ber of pectoral fin rays is different, bein 14 in *gracilis* and 19 in *abyssalis*, the sm broader and the arrangement of the spines of the head is also different. For r small differences I refer to Table XIV. n these three species the dorsal origin lies the axil of the pectorals and the ja also in front whereas in our specim dorsal origin lies about an eye's diameter r back and the upper jaw is projecting.

In the remainding species, *promela* BERT, *atripectus* GARMAN and *breviceps* MAN, the dorsal begins behind the axil pectorals as in *abyssalis*, but the head to be smaller, abt. 7 times into body against 6. In *atripectus* and *breviceps* goes only $1\frac{1}{2}$ times into length of sn against $2\frac{1}{5}$ in our specimen, and in *pro* the eye goes 6 times into length of head 7. From *promelas* it further differs, ac to the original description, in having depth going 3 times into trunk agai times, in having longer ventrals etc.

I am fully aware of the incertitude re many points in this comparison; ther however, to be such differences betw specimen and those already described. do not venture to identify if with any Because of this I have found it nece erect a new species for it.

Remarks on some previously described spec *Porogadus*.

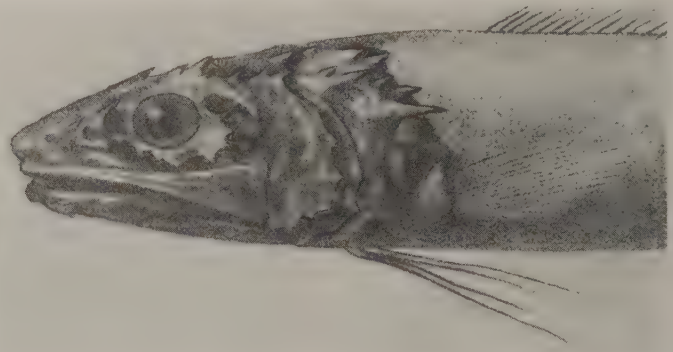
During my visits to London and had the opportunity to see specimens previously described species of *Poroga* the hope that my observations will be value to other ichthyologists working intricate genus, rich in described sp here add some remarks on them. I h together some percentage values f measurements and some counts in Ta

gadus gracilis (GÜNTHER). The type and specimen of the species is kept in the Museum (Nat. Hist.), London. It is well preserved, but the posterior part tail is lacking. The proportion between of head and body as given above and table is therefore calculated from the nt figure in the description given by ER in the »Challenger Report» (Pl. g. B.). As most of the features charac- of this species can be found from the rison with *P. abyssalis* given above, I an confine myself to referring to this Table XIV and Figures 5—6 on Pl. VI.

gadus subarmatus VAILLANT. VAILLANT mentions that 11 specimens of this were taken at the »Talisman» St. CI. Muséum National d'Histoire Naturelle, there were at my visit, besides the en designed as type, four more speci- one of which was obtained by exchange e Natural History Museum, Göteborg; ore specimen is kept in the British m (Nat. Hist.), London. Moreover I establish that the small specimen from me station, by VAILLANT designed as *P. udus*, does not belong to this species but *subarmatus*. The reasons for this inter- ion of mine are, I think, verified by the given in Table XIV. This comparatively aterial, 7 specimens, allows us to estimate, t to some degree, the range of variation this species, above all the alterations in tions with increasing size, and taking alterations into consideration, the small en in question fits perfectly well with her specimens of *subarmatus*. Special ion must be paid to the greater height d, length of snout and of lower jaw in tage of length of head in the small en than in *P. nudus*, type, the smaller r of rays in the pectorals and the larger r of long gill-rakers. In all these points is good agreement with the other speci- of *P. subarmatus*. It is finally worth noting that they were all taken in one and the same catch. The feature which obviously has misled VAILLANT is that the spines on the head are better developed in the small specimen than in the larger ones of *subarmatus*, obviously a juvenile character. A photograph of the head of the specimen now belonging to our museum is reproduced in Fig. 7, Plate VI; the 1st branchial arch with its many long rakers and few rudimentary rakers on the lower part of the arch (only one on the ceratobranchial piece) is drawn in Textfig. 20.

Porogadus nudus VAILLANT. The type of this species is preserved in the Muséum National d'Histoire Naturelle, Paris. It is the only known specimen, the small one with hesitation identified as *P. nudus* by VAILLANT being a young *P. subarmatus* (see above under this species). The main characteristics of *P. nudus*, besides the strongly developed head spines, are the comparatively long but low head, about as in *P. abyssalis*, the short snout and comparatively short lower jaw, the large number of pectoral rays and the small number of long gill-rakers and great number of rudimentary rakers on the lower part of the 1st branchial arch, thus about the same conditions as in *P. abyssalis* (see Table XIV). In Textfig. 21 I have tried to demonstrate the arrangement of the head spines; the drawing is a combination of VAILLANT's Pl. XXIV, Figs. 2 and 2 a, and a sketch made by me in Paris.

Porogadus melanocephalus (ALCOCK) and *P. trichiurus* (ALCOCK). Specimens of these two species are represented in the collections of the British Museum (Nat. Hist.). Of the former species there is a single specimen, designed as type, of the latter there are one larger and two smaller specimens. None of them is in a good state of preservation, on account of which the statements in the Table XIV about these two species are rather approximate. Both belong, like *P. nudus*, to the group with well developed head spines, and both are



Textfig. 21. Head of *Porogadus nudus* VAILLANT, viewed from the left. From VAILLANT (1888, PL. XXIV, fig. 2) with head spines after a sketch made by the present author. × 2.

characterized by a long head, even proportionately longer than in *P. nudus* but proportionately higher with a comparatively long snout. In *P. melanocephalus* the lower jaw is comparatively short and the number of gill-rakers small, 3+12+abt. 3, thus smaller than in all the other species seen by me, whereas *P. trichiurus* has a comparatively longer lower jaw and a larger number of gill-rakers, 4+18+? (the largest specimen, the two others not counted). It seems consequently as if these two species are well separated from one another as well as from *P. nudus*, though we need much more information in order to have them well characterized.

Penopus microphthalmus (VAILLANT). Regarding VAILLANT's »*Sirembo microphthalmus*» I have already mentioned some of the most important features of this species, represented by three rather well preserved specimens, including the type, in the Muséum National d'Histoire Naturelle, Paris, which in my opinion justify its separation from the genus *Porogadus* and its placing together with the species *macdonaldi* GOODE & BEAN in a separate genus *Penopus*, as stated on p. 287 above.

Genus **Mixonus** GÜNTHER

Mixonus (?)laticeps (GÜNTHER)

(Plate V, fig. 3; Textfigs. 22, 23)

Synonyms and Literature:

Bathynectes laticeps GÜNTHER 1878 p. 20.

Bathyonus laticeps GOODE & BEAN 1886 a p. 604.

Mixonus laticeps GÜNTHER 1887 p. 10 xxv, Fig. B; GOODE & BEAN 1895 p. Fig. 296 A; JORDAN & EVERMANN 1 2523; KOEFOED 1927 p. 133.

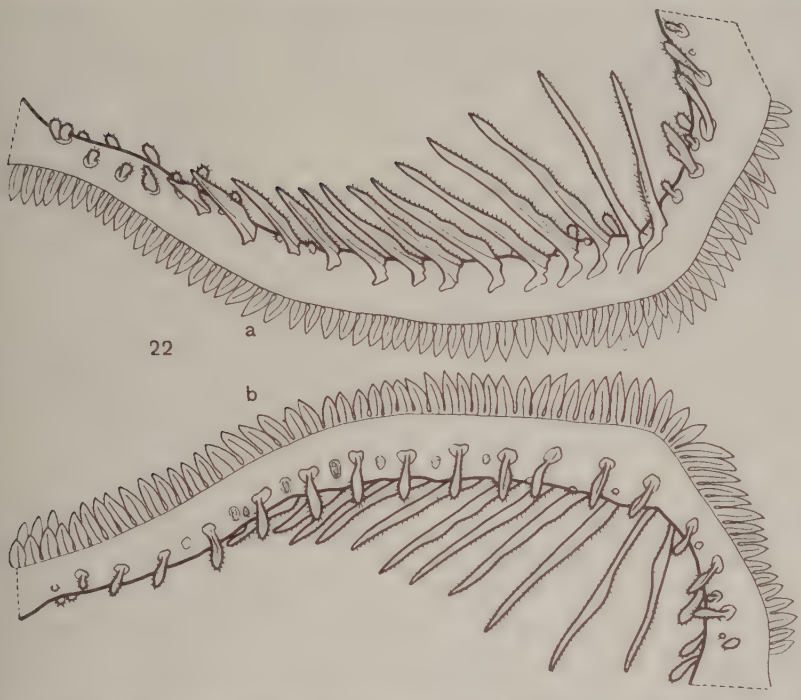
Sirembo Guentheri VAILLANT 1888 p. 2 xxiv, Fig. 5.

Mixonus (*Bathynectes*) *laticeps* VAILLAN p. 386.

Material: St. 313 (Haul No. 1), N W 17° 39′—N 30° 05′ W 17° 18′, Jun 1948; depth 4,267—4,255 m: 1 speci

The specimen in question is unfort rather badly damaged; the tip of the broken off, all scales are lost, the skin is removed from the head, on which the o are damaged, and all fin rays are brok The general shape of the body is, ho rather characteristic, with the greatest in the neck region, from which it tapers g ly backward. The following measurem mm will give an idea of the appearance specimen, although many of them a approximate owing to its bad state.

Length of body	3
Length snout to dorsal	0
Length snout to anus	8
Length snout to anal	2
Height of body at base of pectorals	3
Height of body at anus	7
Height of body at hindmost part	

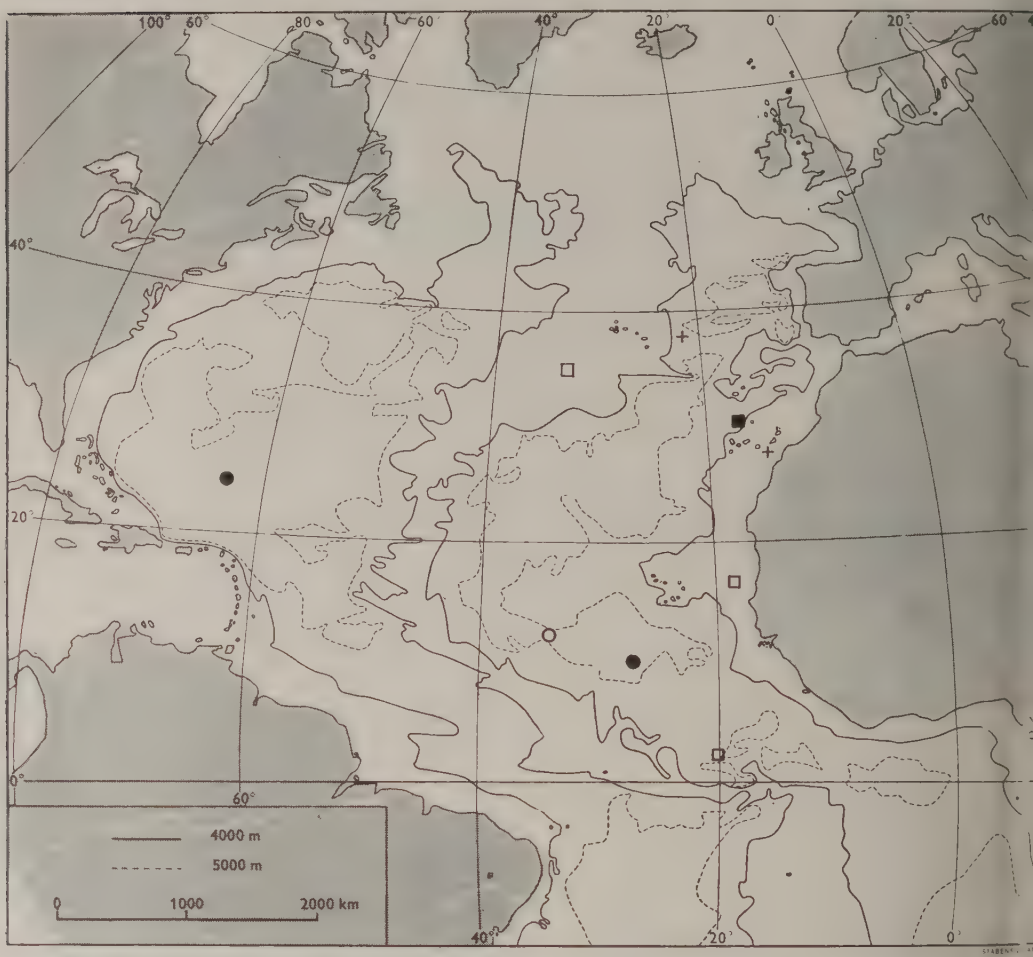


. 22. 1st left branchial arch of *Mixonus* (?)*laticeps* (GUNTHER). a from the outer side, b from the inner side. × 4.

ı of body at base of pectorals		20
ı of body at anus		14
of head	abt.	43
ıdı of head	abt.	24
ngt of upper jaw		22
gt of snout		11
ıer of eye	abt.	5
ital width		14
of rays in dorsal		94+?
of rays in anal		68+?
of rays in pectorals		18/18
of rays in ventrals		2

he epibranchial piece of the 1st left l arch (Textfig. 22) there are 5 short with a small patch between the first e second, and a small, knob-like one en the third and the fourth; a long raker joint between the epibranchial and anchial pieces is followed by 12 long n the lower part of the arch, decreasing h forwards, and before them there are knob-like rakers, the two foremost situated close together, perhaps an individual variation.

According to the key to the Brotulid genera by NORMAN (1939), this specimen must belong to the genus *Mixonus* GÜNTHER. The three species included in this genus, *laticeps* (GÜNTHER), *pectoralis* (GOODE & BEAN), and *caudalis* GARMAN, are not easily distinguishable with the aid of the poor data given in the literature, and without any material for comparison a definitive identification of this damaged specimen must rest somewhat doubtful. At first sight the fact that the dorsal fin begins decidedly behind the vertical through the pectoral fin base seemed to speak in favour of an identification with *M. pectoralis*, but this species has a much shorter snout, the length of which is less than 18 % of length of head according to GOODE & BEAN, against abt. 22 % in *caudalis* and abt. 25 % in *laticeps*, which latter value is in good accordance with that for the present specimen. A difficulty regarding a further



Textfig. 23. Distribution of *Mixonus laticeps* (GÜNTHER) (□ = earlier finds, ■ = Sw. Deep-Sea Exp.), *M. profundissimus* (ROULE) (○ = type locality, ● = Sw. Deep-Sea Exp.), and *B. squamosus* (ROULE) (

comparison with *M. laticeps* lies in the fact that our specimen is much larger than any of the hitherto known specimens of this species, more than 233 mm, whereas the type specimen measures only 140 mm, that described by VAILLANT 170 mm and that mentioned by KOEFOED 126 mm, but as far as I can see the only difference between our specimen and the three hitherto known lies in the feature that in the former the dorsal fin begins somewhat more posteriorly in relation to the vertical through the pectoral fin base, a feature upon which, in my opinion, only little stress can be laid in this case because of the great difference in size just mentioned. Moreover, our s
was taken within the same area in w
previous three specimens were captured
in the eastern part of the North Atlanti
also seems to speak in favour of an id
tion with *M. laticeps*.

Bathymetrical distrib
The type specimen of *M. laticeps* was
at a depth of 4,575 m, that taken
»Talisman» Expedition at 3,200 m a
by »Michael Sars» between 2,615 a
m. Our find at a depth of 4,267—4,25
falls within the bathymetrical limits
laticeps.

drographical conditions. ittle is known about these. The type 7, »Challenger» St. 104, had a bottom ature of +2.56 °C., our St. 313 a temperature of +2.42° C. and a of 34.89 ‰.

graphical distribution (Map, . 23). *M. laticeps* was first taken at hallenger» St. 104, N 02° 25′ W 20° 01′, two further localities are the »Talisman» N 16° 38′ W 18° 24′ (20° 44′ according ILLANT, apparently counted from the n of Paris) and the »Michael Sars» St. 34° 59′ W 33° 01′. Our station 313, 48′ W 17° 39′, lies within the same According to our present knowledge the ition of *M. laticeps* is confined to the part of the North Atlantic.

enus **Bassogigas** Goode & Bean

In my »Introduction and Station List» RUIN 1951, pp. 15 and 21), I mentioned tch of two Brotulid specimens at St. d 371 respectively, already identified in the expedition as *Grimaldichthys profundissimus* Roule.

In his valuable treatment of the Brotulids the »John Murray Expedition» Report, NS (1939) supposes that the genus *Grimaldichthys* Roule is probably identical with *Mastigopterus* Smith & Radcliffe. As the latter name was published some days before, *Grimaldichthys* should be suppressed as being only a synonym of *Mastigopterus*. Because I it seemed to me very desirable to make a direct comparison between specimens of the species of the two genera. To my enquiry, Dr. Schultz, Curator of Fishes at the Smithsonian Institution, U. S. National Museum, Washington, replied that the only specimen of *M. imperator* Smith & Radcliff is the type-specimen, which could not be lent out, but on my further request he kindly sent me a sketch of the dentition in the mouth cavity, a feature which, as will be demonstrated later on, seems to be very characteristic of the members of the genus *Grimaldichthys*. This sketch, a reproduction of which is given in Textfig. 33, clearly shows that the dentition is quite different in *M. imperator* and *G. profundissimus* (Textfig. 29), which in my opinion is sufficient to render an identification of *Grimaldichthys* with *Mastigopterus* impossible.

After the return of the Danish »Galathea» Expedition 1950—52, I had the opportunity to see a Brotulid specimen, caught by the expedition at a depth of 7,130 m, and preliminarily identified by the leader of the expedition, Dr. Anton F. Bruun, as a *Bassogigas*, closely related to *B. pterotus* Alcock. At first glance I thought it to be a *Grimaldichthys*, closely related to, if not identical with, the species *profundissimus*. The similarity with *B. pterotus*, previously overlooked by me, made it highly desirable to make a direct and more detailed comparison between the species described by Alcock and the members of the genus *Grimaldichthys*. On my request the authorities of the Indian Museum, Calcutta, had the great kindness to send me as a loan one of Alcock's type specimens (No. 13046), the study of which has been of decisive importance for the question of the validity of the genus *Grimaldichthys*. As will be shown later on, I have not been able to find any differences of generic value between *B. pterotus* and the two species attributed to the genus *Grimaldichthys*, and, moreover, I have come to the conclusion that the second species of this genus, *G. squamosus* Roule, is very closely related to, perhaps identical with, *B. pterotus*.

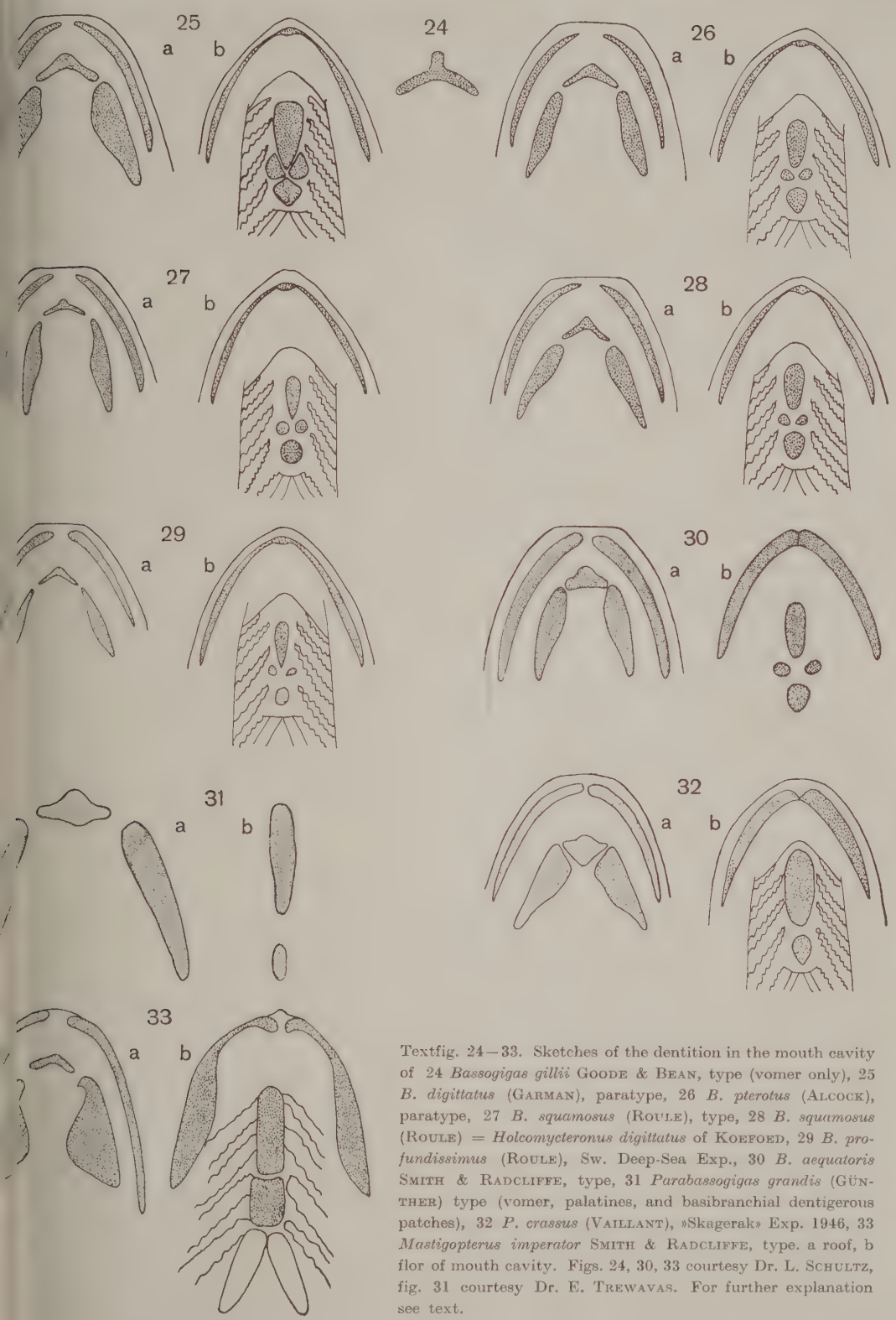
The next step was to decide whether *B. pterotus* is a true *Bassogigas* or not. In a previous paper (Nybelin 1948), when discussing the systematical position of *Bythites crassus* Vaillant, which was placed by me in the genus *Bassogigas*, I tried to point out, firstly, that *Bassogigas gillii* Goode & Bean must be

considered as the type species of the genus, secondly, and this in accordance with NORMAN (1939), that the genus *Holcomycteronus* GARMAN must be included in the genus *Bassogigas*. But as the species can be divided into two apparently natural groups because of the different shape of the pectorals, as already stated by NORMAN, I proposed to divide the genus into two subgenera, *Bassogigas* s. str., comprising *B. gillii* GOODE & BEAN, *grandis* (GÜNTHER) and *crassus* (VAILLANT), and *Holcomycteronus* with the species *digittatus* GARMAN, *brucei* (DOLLO), *pterotus* (ALCOCK), *aequatoris* SMITH & RADCLIFFE and, with some hesitation, *stelliferoides* (GILBERT).

It was consequently first necessary to establish whether the type species of the supposed subgenus *Holcomycteronus* showed the same peculiarities as to the very characteristic dentition on vomer and palatines and, above all, on the basibranchials. Of *H. digittatus* there are known the five specimens originally described by GARMAN (1899) from the Pacific Ocean, to which KOEFOED (1927) has added a specimen taken by the Norwegian »Michael Sars» Expedition in the North Atlantic. Judging from the descriptions given by GARMAN and by KOEFOED, I was convinced that the specimen from the North Atlantic could not be identical with GARMAN's species, for which reason I proposed (NYBELIN 1954) the name *Bassogigas* (*Holcomycteronus*) *koefoedi* n. sp. for the specimen investigated by KOEFOED. Later I had the opportunity to study this specimen, thanks to the courtesy of my friend Prof. H. BRATTSTRÖM, Director of the Zoological Museum, Bergen, Norway. This study proved that I had been too hasty in my creation of a new species, as the specimen proved to be identical with *Grimaldichthys squamosus*! The reasons for this identification will be given below.

This unexpected result made it highly desirable to compare these specimens with the true *Holcomycteronus digittatus*, the type of *Holcomycteronus*, and on my reque Director of the Museum of Compa Zoology at Harvard College, Cambridge, U. S. A., was kind enough to send me loan one of the specimens (No. 28641) original material of GARMAN. As w discussed in more detail below, this spe shows in principle the same pecul concerning the dentition on vomer, pa and basibranchials as the above men specimens, but differs regarding certain in this respect as well as in others, a this reason *B. pterotus* and *G. squamosus* be regarded as species different fro closely related to *H. digittatus*.

As a consequence of these finding question of the relations between *Bas* and *Holcomycteronus* has to be taken up Of the species ascribed to the subgenus *gigas* I have only had the opportun study *B. crassus*, and this species sh pattern regarding the dentition on palatines and basibranchials quite di from that in the above mentioned spe belonging to the *Holcomycteronus* type dentigerous part of the vomer is not t V-shaped but rather triangular (see Te 25 and 32), and on the basibranchia paired rounded dentigerous knobs are Regarding *B. grandis*, GÜNTHER (1887) d es the dentition on vomer and palat follows: »The vomerine teeth form a tri patch, much broader than long; the w the palatine band exceeds that of the maxillary». On my request Dr. E. TRE British Museum (Nat. Hist.), has kind me a sketch of GÜNTHER's type sp reproduced in Textfig. 31, which clearly the almost triangular vomerine patch as the fact that the paired basibranch ches are lacking. From these facts it sequently quite clear that *grandis* and show almost the same more or less tri form of the vomerine patch, distinctl rent from the broadly V-shaped f



Textfig. 24—33. Sketches of the dentition in the mouth cavity of 24 *Bassogigas gillii* Goode & Bean, type (vomer only), 25 *B. digittatus* (Garman), paratype, 26 *B. pterotus* (Alcock), paratype, 27 *B. squamosus* (Roule), type, 28 *B. squamosus* (Roule) = *Holcomycteronus digittatus* of Koefoed, 29 *B. profundissimus* (Roule), Sw. Deep-Sea Exp., 30 *B. aequatoris* Smith & Radcliffe, type, 31 *Parabassogigas grandis* (Günther) type (vomer, palatines, and basibranchial dentigerous patches), 32 *P. crassus* (Vaillant), »Skagerak» Exp. 1946, 33 *Mastigopterus imperator* Smith & Radcliffe, type. a roof, b flor of mouth cavity. Figs. 24, 30, 33 courtesy Dr. L. Schultz, fig. 31 courtesy Dr. E. Trewavas. For further explanation see text.

Holcomycteronus, and that in *grandis* and *crassus* there are only two median unpaired basibranchial patches.

How, finally, the type species of the genus *Bassogigas*, *B. gillii*, stands in these respects is not clear from the original description. In their diagnosis of the genus GOODE & BEAN (1895) state: »vomerine patch V-shaped, but with its arms broadly expanded and thicker at the angle, so that it is almost triangular.» About the basibranchial patches no information was given. On my request Dr. L. SCHULTZ has kindly given me the information that the type specimen of *B. gillii* (U. S. N. M. 39417) and that of *B. aequatoris* (U. S. N. M. 47137) »have essentially the same dentition as your sketch of *B. digittatus*.» He also kindly enclosed sketches of some details in the dentition of the two type specimens in question, which are reproduced in Textfigs. 24 and 30.

These statements regarding *B. gillii*, quite surprising to me, give the question of the systematical arrangement of these Brotulids a wholly new aspect. In my opinion there can be no doubt that the pattern of the dentigerous patches in the mouth cavity is a feature of much greater importance taxonomically than is the size and outline of the pectoral fins. In consequence, the earlier supposed difference between *Bassogigas*, represented by the type species *gillii*, and *Holcomycteronus* is very much weakened, and not even the assumed subgeneric division of the genus *Bassogigas* can be maintained, at least not with our present knowledge. Because of this I now consider *Holcomycteronus*, like *Grimaldichthys*, as being merely a synonym of *Bassogigas*.

Regarding the genus *Bassogigas* the following has to be added to the generic diagnosis: Villiform teeth on vomer forming a broadly V-shaped patch, those on the basibranchials forming four patches, two median unpaired, a larger anterior and a smaller posterior, and between them two rounded paired patches symmetrically arranged.

The type of the genus is *B. gillii* Goo BEAN and further species are *B. dig* (GARMAN), *B. pterotus* (ALCOCK), *B. squa* (ROULE) [syn. *H. digittatus* of KOEFOED *koefoedi* NYBELIN)], *B. profundissimus* (R *B. aequatoris* SMITH & RADCLIFFE and bably *B. brucei* (DOLLO).[1])

As a consequence of this arrangeme species *grandis* (GÜNTHER) and *crassus* LANT) must be removed from the genus *gigas* as here defined. As they mo cannot be included in any other of the Br genera hitherto described, I am forc erect for them a new genus, which I p to name *Parabassogigas*, with the foll preliminary diagnosis: Similar to *Bass* but villiform teeth on vomer forming a or less triangular patch, those on the branchial forming two median unpaired pa a larger anterior and a smaller posteri paired rounded patches between then type species I propose the longest s species *grandis* (GÜNTHER), a second s is *crassus* (VAILLANT). For the two sp give the following synonyms:

Parabassogigas grandis (GÜNTHE
(Textfig. 31)

Sirembo grandis GÜNTHER 1877.
Neobythites grandis GÜNTHER 1887.
Bassogigas grandis JORDAN & FOWLER TANAKA 1908, NYBELIN 1948, 1954.

Parabassogigas crassus (VAILLA
(Textfig. 32)

Bythites crassus VAILLANT 1888.
Neobythites crassus GOODE & BEAN 1895 FOED 1927.
Bassogigas crassus NYBELIN 1948, 1954.

To facilitate the following account opinion upon species and synonyms genus *Bassogigas*, I find it convenient in tabular form my measurements and

[1]) See postscript, p. 324.

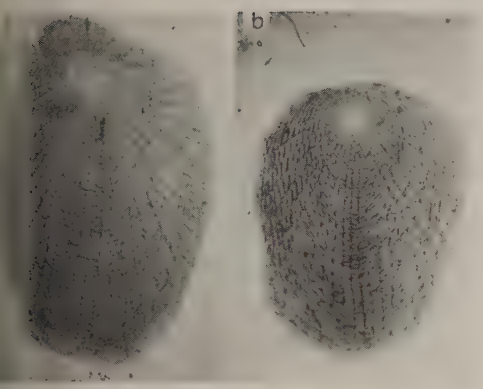
e XV) as well as some percentage values e XVI) for all the *Bassogigas* specimens igated by me, before discussing their ership of different species.

m the values given in Table XVI it is us that all the specimens investigated only minor differences regarding most of dy proportions. The most important diffe- refer to length of snout, interorbital , horizontal diameter of eye and length ter and inner ventral ray. These diffe-, already clearly visible as percentage dy length, become more accentuated as ntage values of length tip of snout to tip ercular spine (= length of head according ITH & RADCLIFFE), and in these respects ecimens can be divided into three groups. rst, comprising only the paratype of *H. di-tus*, has a comparatively long snout (abt. of the last named length), a moderate ter of eye (abt. 10 %) and very short and inner ventral rays (30 and 25 % tively). The second group, comprising aratype of *Neobythites pterotus* ALCOCK, ype of *Grimaldichthys squamosus* ROULE *Iolcomycteronus digittatus* of KOEFOED, is cterized by a short snout (abt. 22—26 %), nparatively large diameter of eye (abt. 3 %) and comparatively short outer and ventral rays (abt. 37—39 and 32—34 % tively). The third group, comprising hree known specimens of *Grimaldichthys ndissimus* ROULE, has a comparatively snout (abt. 28—30 %), a very small dia- of eye (abt. 8.5 %) and comparatively outer and inner ventral rays (53—60 7—40 % respectively). To those diffe- may be added the different number of al rays, as far as they are known, and all the differences regarding dentition mer, palatines and basibranchials and of the 1st branchial arch. In the first (Textfig. 25) the dentigerous part of the nes is very broad, much broader than of the intermaxillaries, and the four basibranchial patches are likewise strongly developed, almost contiguous. In the second group (Textfigs. 26, 27, 28) the palatine patches are narrower but conspicuously broader than the intermaxillaries, and the basibranchial patches are smaller and well separated. In the third group (Textfig. 29) the dentition is poorly developed, the palatine patches are hardly broader than the intermaxillaries, and the basibranchial patches are comparatively still smaller than in the second group. Regarding the 1st branchial arch we meet corresponding differences. In *H. digittatus*, paratype, the gill-rakers are comparatively short and stout and the dentigerous patches between them as well as between the knobs on the inner side are strongly developed, mostly filling out the interspaces almost completely (Textfig. 34). In *N. pterotus*, paratype, and *H. digittatus* of KOEFOED, the gill-rakers are somewhat slenderer and longer and the dentigerous patches between them as well as on the inner side of the arch are smaller (Textfigs. 35, 36). And in *G. profundissimus* the gill-rakers are comparatively long and slender and the dentigerous patches are few and only weakly developed (Textfigs. 37, 38).

There are some minor differences regarding some proportions between the three specimens just mentioned as belonging to the second group in Table XVI, but they are, in my opinion, not greater than what may be expected for individual variations within a species. The paratype of *Neobythites pterotus* has, however, a larger number of rays in dorsal and anal, 128 and 100 respectively, against 110—111 and 86 respectively for the two specimens from the North Atlantic. This seems to be a rather striking difference and makes one hesitate in regarding them as belonging to one and the same species. The scales seem to be decidedly smaller in the paratype of *B. pterotus* than in KOEFOED's specimen (Textfig. 39). There are moreover small differences as to some details on the

Textfig. 34 -38. 1st left branchial arch of 34 *Bassogigas digittatus* (GARMAN), paratype, 35 *B. pterotus* (ALCOCK), p
36 *B. squamosus* (ROULE) = *Holcomycteronus digittatus* of KOEFOED, 37 *B. profundissimus* (ROULE), Sw. Deep-S
St 371, 38 *B. profundissimus* (ROULE), Sw. Deep-Sea Exp., St 329. a from the outer side, b from the inner sid
34—36 × 2.5, figs. 37, 38 × 3.

1st branchial arch. The long gill-rakers are somewhat shorter in *B. pterotus* (Textfig. 35) than in KOEFOED's specimen (Textfig. 36), above all the foremost of them is decidedly shorter and broader than the corresponding one in the latter specimen, and they much more densely denticulated. M the dentigerous patches between the on the outer as well as on the inner sid arch are larger in *pterotus* than in Ko



. . 39. Scales from the body about 20 mm behind ercular spine of a *Bassogigas squamosus* (ROULE) ED's *H. digittatus*), and b *B. pterotus* (ALCOCK), paratype. Photo × 10.

nen (how the type specimen of *B. squa-* stands in these respects I don't know, as features had no special importance to ring my visit to Monaco in 1949). It is urse possible that the differences just oned regarding the 1st branchial arch be due to individual variations, but g also the differences in number of rays e dorsal and anal fins, the different size e scales and the different habitat into deration I do not dare at present to unite pecimens from the North Atlantic with from the Indian Ocean. The question be left open till we have better informa- about the range of variation in these cts on a much larger material.

sequently I consider *B. pterotus* and *quamosus* as very closely related but ct species with the following synonyms:

Bassogigas pterotus (ALCOCK)

(Textfigs. 26, 35, 39)

ythites pterotus ALCOCK 1890 a, 1890 b, 91.

gigas pterotus GOODE & BEAN 1895; RMAN 1939; NYBELIN 1954.

ythites (*Bassogigas*) *pterotus* ALCOCK 1899.

gigas (*Holcomycteronus*) *pterotus* NYBELIN 48.

Bassogigas squamosus (ROULE)

(Textfigs. 23, 27, 28, 36, 39)

Grimaldichthys squamosus ROULE 1916, 1919; NYBELIN 1954 p. p.

Holcomycteronus digittatus KOEFOED 1927.

? *Mastigopterus squamosus* NORMAN 1939.

Bassogigas koefoedi NYBELIN 1954 p. p.

Bassogigas profundissimus (ROULE)

(Plate V, fig. 4; Textfigs. 23, 29, 37, 38, 40)

Synonyms and Literature:

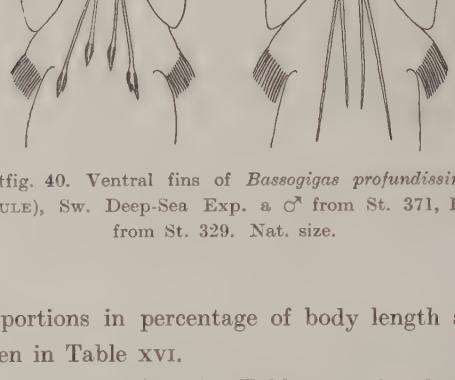
Grimaldichthys profundissimus ROULE 1913; 1916 p. 19; 1919 p. 67, Pl. II, Fig. 2, 2 a—f; NYBELIN 1951 pp. 15 and 21; 1954.

? *Mastigopterus profundissimus* NORMAN 1939 p. 88.

Material: St. 329 (Haul No. 3), N 09° 38′ W 26° 20′—N 09° 50′ W 26° 30′, July 3rd 1948; depth 5,610—5,600 m: 1 specimen ♀. St. 371 (Haul No. 10), N 24° 12′ W 63° 23′—N 24° 28′ W 63° 18′, Aug. 20th 1948; depth 5,850—5,860 m: 1 specimen ♂.

This species is remarkable as having been for 50 years the deepest living fish known to us. Before the Swedish Deep-Sea Expedition it was known only in the type specimen. Two more specimens, one slightly larger than the type, one somewhat smaller, were obtained during our expedition. At first sight on board they could already be preliminarily identified as *Grimaldichthys profundissimus* with the aid of the excellent painting reproduced in ROULE 1919, Pl. II, Fig. 2, though they had been somewhat damaged in the trawl. Moreover I have had the opportunity to see the type specimen in the Oceanographic Museum at Monaco and to compare it directly with the smaller of our specimens, and this comparison has proved that there can be no doubt about the specific identity of the three specimens.

The measurements and counts for the two specimens are to be found in Table XV; the



Textfig. 40. Ventral fins of *Bassogigas profundissimus* (Roule), Sw. Deep-Sea Exp. a ♂ from St. 371, B ♀ from St. 329. Nat. size.

proportions in percentage of body length are given in Table XVI.

From the values in Table XVI it should be quite clear, as already mentioned above, that the similar general appearance between the three specimens is confirmed by a close agreement regarding the proportions of the various parts of the body investigated. Especially the values for the type specimen and those for that from St. 371 agree very closely, apart from the lower value for the interorbital width. This is smaller in the type, in all probability owing to some degree of shrinkage of the loose skin on the head after the specimen had been transferred into alcohol; our specimens are fixed and still preserved in formalin. The most striking difference between the type specimen and that from St. 371 on the one hand and that from St. 329 on the other is the proportionately greater length of the distance snout to anal and the correspondingly shorter length of base of anal in the latter. As I supposed that the greater extent of the visceral cavity, as indicated by these proportions, might be a female feature, I have examined the gonads of our two specimens and have found that the specimen from St. 329 is a female, that from St. 371 a male. As this latter specimen has a stronger fold around the anal opening, it can be concluded that the males of *B. profundissimus*, like many other Brotulids, have some kind of »male genital papilla», the structure of which cannot be cleared up in detail on this specimen. The type specimen has likewise a conspi fold around the anal opening and, as before, a comparatively short distance to anal, and may therefore be regarded male. In both the specimens regard males the outermost part of the venti somewhat flattened and the flat part provided with a longitudinal stripe of brown pigment at each border (Textfi this feature is not marked in the illustr given by Roule), whereas the oute part of the ventrals on the female speci filamentous; probably this is another difference.

Regarding the number of rays in the fins, that for the pectorals cannot be in our specimens because of damag the specimen from St. 371 some o prolonged rays are still present, the l being about 45 mm in length, reach little behind the anus; in that from S only the basal parts remain, distorte covered by thick skin, and the rays conse ly cannot be counted with any degr accuracy. For the type specimen, l gives 15—16 pectoral rays; I have co 15 on the right pectoral, the left was inacc for counting in the mounted specimen the unpaired fins Roule gives abt. 12 in the dorsal and 90 in the anal; accord my own counts there are 111 rays dorsal and 89 in the anal of the typ the larger of our specimens I have c 110 in the dorsal and 85 in the and on the smaller 107 in the dorsa anal is unfortunately too much da to allow an exact count. In all three mens I have found the number of rays to be 8.

The gill-rakers on the 1st left br arch are as follows: in the specimen fr 329 (Textfig. 38 a) there are 4 very rakers on the epibranchial piece, 1 long joint between the epi- and ceratobr pieces, and 8 long and 6 very short ra

wer part of the arch (cerato- and hypo- ial pieces). In the specimen from St. 'extfig. 37) the corresponding numbers 1: 9: 6. For the type specimen I have »4: 9: 6», which evidently must be the s in our specimen from St. 329. Besides, are some small accessory dentigerous s or plates (see Textfigs. 37 and 38 a). inner side of the arch (Textfig. 38 b) re three more or less stalked dentigerous on the epibranchial piece and 12 on ato-hypobranchial pieces with only few significant dentigerous patches between The gill filaments are of about the same as the width of the branchial arch, or hat shorter.

rding the shape of the dentigerous s on vomer, palatines and basibranchials refer to Textfig. 29, and to what has aid above on p. 299. It must however d that the illustration given by ROULE Pl. II, Fig. 2 d) is not quite adequate, two rounded dentigerous patches are ity situated nearer to the posterior end anterior median patch, and as the or median patch is omitted.

Bathymetrical distribution. athymetrical distribution of *B. profundissimus* is of special interest, as the type specimen was said to have been taken at a of 6,035 m, thus deeper than any other ecies at that time. Even if the depth, ed with a sounding machine, may have mewhat shallower than stated, because hodological inaccuracy and because of t that the actual depth of the gear uld ot be checked during the haul, it was tedly the deepest record of bottom efore our expedition, the next deepest bt. 5,400 m. The two new records of cies, at 5,850—5,860 and 5,610—5,600 ctively, are consequently highly accept- a proof that this species actually lives great depths. The fact that *B. profundissimus* has been taken in all the three deepest hauls in which fishes considered as bottom fishes have been caught in the Atlantic, but in no others, strongly supports the opinion that it really is restricted to the bottom at very great depths, and has not, as has sometimes been supposed, been taken in intermediate water layers during the hauling up of the trawl.

Hydrographical conditions. For the type specimen no data are given. At the two stations at which *B. profundissimus* was taken by the Swedish Deep-Sea Expedition, the bottom water had a temperature of +2.35 and +2.06° C. respectively and a salinity of 34.87 and 34.98 ‰ respectively.

Geographical distribution (Map, Textfig. 23). To our present knowledge, *B. profundissimus* is confined to the North Atlantic. The type specimen was taken at N 12° 07′ 30″ W 33° 32′ 15″ in the Cape Verde Basin to the east of the Central Ridge, and one of our specimens was captured in the same deep basin, somewhat more to the southeast, at N 09° 38′ W 26° 20′. Our second specimen, however, was taken far to the west of the Central Ridge, at N 24° 12′ W 63° 23′, which proves that this ridge does not constitute any insurmountable barrier even for this extremely deep-living species.

Genus **Lamprogrammus** ALCOCK

The genus *Lamprogrammus* was erected by ALCOCK in 1891 for the species *niger* and is undoubtedly one of the most characteristic Brotulid genera because of the peculiar development of the lateral line and the absence of ventral fins. To the type species ALCOCK added, in 1892, a second species, likewise from the Indian Ocean, *L. fragilis*. In 1899 GARMAN described *L. illustris* from the Gulf of Panama, and in 1913 SMITH & RADCLIFFE added a fourth species, *L. macropterus*, from Buton Passage to the south of the Celebes.

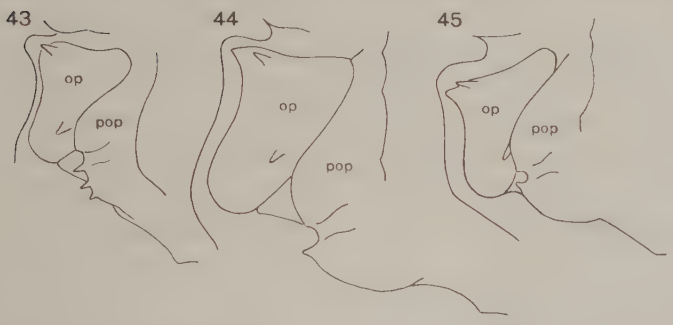
BRAUER (1906), when studying the *Lampro-*

Textfig. 41—42. 1st left branchial arch of 41 *Lamprogrammus fragilis* ALCOCK (John Murray Exp. St. 54), and 42 ALCOCK (John Murray Exp. St. 143). a from the outer side, b from the inner side. × 1.5.

grammus specimens taken by the »Valdivia» in the Indian Ocean, could not find any distinguishing features between *L. fragilis* and *L. niger*, and consequently considered the former merely as a synonym of *L. niger*, and WEBER (1913) was of the same opinion.

In his treatment of the fishes obtained during the »John Murray Expedition 1933—34», NORMAN (1939) separates *L. niger* and *L. fragilis*, but remarks concerning the latter: »This species may prove to be identical with the preceding» [i. e. *L. niger*]. During my visit to London I had the opportunity to see NORMAN's material of *L. niger* from St. 124 (1 specimen) and 143 (6 specimens) and of *L. fragilis* from St. 54 (5 specimens), and besides a specimen labelled: »Lamprogrammus niger. Bay of Bengal off W. Coast of N. Anaman, 561 fms», and designed as type. Apart from some external features, above all the lighter colour and greater length of head (abt. 24—26 % of body length against 21—22 % in *L. niger*) the *fragilis* specimens differed from *L. niger* in having a greater number of gill-rakers on the anterior arch, 22—25, with only 2—3 rudimentary rakers on the lower part of the arch against 18 [illegible] *L. niger* with 5—7 rudimentary rakers [illegible] lower part (Textfigs. 41 and 42). Th[illegible] the courtesy of the British Museum [illegible] Hist.), I later got as a loan one spec[illegible] *L. niger* from St. 143 and one of *L.* [illegible] from St. 54 for further study. The com[illegible] has shown that the difference betw[illegible] two species, mentioned by ALCOCK, re[illegible] the free hind border of the preope[illegible] which in *L. fragilis* is provided wit[illegible] minute but distinct spines below the er[illegible] tion, whereas in *L. niger* no such sp[illegible] to be found (Textfigs. 43 and 44), ho[illegible] for these specimens and consequently [illegible] the other differences just mentioned. [illegible] of this I think that *L. fragilis* ALCOCK [illegible] considered as a valid species.

Lamprogrammus macropterus seems [illegible] from the other species of the genus i[illegible] in the narrower interorbital width go[illegible] 3.5 times into the length snout to tip [illegible] cular spine against 3 times or gener[illegible] in the other species. The greater nu[illegible] fin rays, above all in the pectorals, al[illegible]



43—45. Right opercular region of 43 *Lamprogrammus fragilis* Alcock (John Murray Exp. St. 54), 44 *L. nigeri* Alcock (John Murray Exp. St. 143), and 45 *L. niger* Alcock (Sw. Deep-Sea Exp. St. 41: II). Nat. size.

separate *L. macropterus* from the other

arding *L. illustris* Garman, there has been any doubt about its validity. The ices between it and *L. niger*, as pointed Garman, refer however merely to the r lateral line system as it has been ed by Alcock for *L. niger* and by for *L. illustris*. When trying to identify *mprogrammus* specimen taken by the h Deep-Sea Expedition in the Gulf of a, the type locality of *L. illustris*, I not, however, find any differences of value between it and the above mentio- ecimen of *L. niger* from the »John » Expedition St. 143, as will be demon- below.

ntly Barbour (1942) has mentioned a specimen of *Lamprogrammus* from near West Indies, identified by him as *L.* Garman. About this identification he owever: »Further material may prove am wrong in doing so, — probably will this, — but on the basis of this one hat crushed specimen I cannot do ise». As no description is given by r, and as the figure shows very little han that it must be a *Lamprogrammus*, can be said at present about its rela- o the hitherto described species of this

ny opinion only three species can at present be distinguished in the genus *Lamprogrammus*, which can be separated as follows:

I. Number of gill-rakers 22—25, the longest only abt. five-seventh of diameter of eye; free broder of preoperculum with three spines below the emargination

L. fragilis Alcock

II. Number of gill-rakers 17—21, the longest abt. as long as diameter of eye; free border of preoperculum emarginated but without spines

A. Interorbital width abt. 3.5 times into the length snout to tip of opercular spine; pectorals with 21 rays

L. macropterus Smith & Radcliffe

B. Interorbital width less than 3 times into the length snout to tip of opercular spine; pectorals with 16—18 rays

L. niger Alcock (syn. *illustris* Garman)

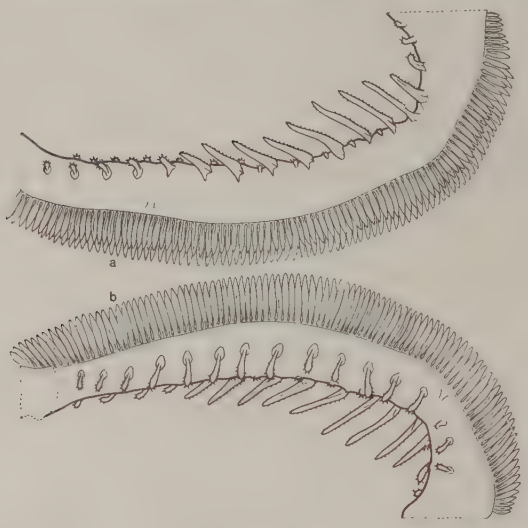
Lamprogrammus niger Alcock

(Plate V, fig. 5; Textfigs. 42, 44—46)

Synonyms and Literature:

Lamprogrammus niger Alcock 1891 p. 33, Fig. 2; 1892 Pl. I, Fig. 2; 1899 p. 95; Goode & Bean 1895 p. 344, Fig. 302; Brauer 1906 p. 308 (e. p.?); ? Weber 1913 p. 556; Lloyd 1907 b p. 259; Norman 1939 p. 78.

Lamprogrammus illustris Garman 1899 p. 174, Pl. XXXIV, Figs. 1—6, Pl. LXXXI, Fig. 1; Trotter 1926 p. 112, Fig. 29.



Textfig. 46. 1st left branchial arch of *Lamprogrammus niger* Alcock (Sw. Deep-Sea Exp. St. 41: II). a from the outer side, b from the inner side. × 2.

Material: St. 41:II, N 07° 04′ W 78° 52′, Aug. 28th 1947; ring-net, 1,500 m wire: 1 specimen.

This specimen, captured and preserved by Dr. John Eriksson, is in a very good state (Plate v, fig. 5). Its body length and measurements of the more important parts of the body are given in Table xvii, in which are also given the corresponding measurements of the specimen of *L. niger* loaned from the British Museum (Nat. Hist.), and some measurements taken by me on the specimen, designed as type, in the same museum, and on a *Lamprogrammus* specimen taken by the Danish »Dana» Expedition in 1928—30 by kind permission of Dr. Å. Vedel Tåning, Copenhagen. Some values derived from the descriptions given by Alcock (1899) for *L. niger* and by Garman (1899) for *L. illustris* are also added.

Judging from the area, the Gulf of Panama, in which our specimen, as well as that taken by the »Dana» Expedition, was captured, an identification with *L. illustris* Garman seemed to be the most probable. As I have pointed out above, however, I could not find any important differences between that species and *L. niger* from the descriptions given by A and by Garman, and judging from the given in Table xvii, no difference of value can be found. In some respect are small discrepancies, but they seem due to alterations with increasing age; of body, length of head, diameter length of snout and interorbital widt to decrease, whereas the length of the jaw seems to increase.

Nor can I find any differences of imp in other respects. Regarding the free of the preoperculum, which gives good teristics for separating *L. fragilis* from *L* the specimens from the Gulf of Panam very closely with *L. niger* (Textfigs. 4 The same can be said regarding the of rays in the dorsal, anal and pecto (see Table xvii).

The number and arrangement of t rakers on the 1st branchial arch, one most important characters for disting between *L. niger* and *L. fragilis*, is th in the specimens from the Indian Oce from the Gulf of Panama, as far as judged from the material at my (Textfigs. 42, 46). In the followin I have given the number for all sp investigated by me and have also ad the sake of comparison those for *L.*

Lamprogrammus niger Alcock		
Type (B. M.)	4	1
»John Murray» Exp. St. 124	4	1
»John Murray» Exp. St. 143	4	1
»John Murray» Exp. St. 143	4	1
»John Murray» Exp. St. 143	4	1
»John Murray» Exp. St. 143	3	1
»John Murray» Exp. St. 143	4	1
»John Murray» Exp. St. 143	4	1
Sw. Deep-Sea Exp. St. 41: II	4	1
D. »Dana» Exp. St. 3548: III	4	1
Lamprogrammus fragilis Alcock		
»John Murray» Exp. St. 54	5	1
»John Murray» Exp. St. 54	5	1
»John Murray» Exp. St. 54	5	1
»John Murray» Exp. St. 54	5	1
»John Murray» Exp. St. 54	5	1

rst column in the table indicate the r of gill-rakers on the upper part (= epi- ial piece), the second indicates the n the joint between the epi- and ceratio- ial pieces and the third and fourth the r of long and of reduced rakers respec- on the lower part of the arch (= cerato- pobranchial pieces).

his may be added that ALCOCK says: ten long gillrakers on the outer side first branchial arch», obviously corres- g to columns 2 and 3 in my table, and ARMAN's description »first series of five upper section of the arch and fourteen lower, decreasing in size to rudiments h end of the series»; we may suppose e has reckoned the raker in the joint nging to the upper part of the arch. h cases there is a good agreement bet- he two descriptions and my counts, difference of specific value between ens from the Indian Ocean and the f Panama can consequently be stated this respect.

have not been able to find any other ive characters between *L. niger* and ecimens from the Gulf of Panama at posal, I must consider the latter as ng to that species. Consequently *L.* GARMAN becomes a synonym of *L.* LCOCK.

hymetrical distribution. Indian Ocean ALCOCK has taken this on two occasions at depths of 1,026 1 m respectively. LLOYD (1907 b) men- from a depth of 1,107 m, and moreover aptured by the »John Murray Expedi- 914 and 797 m (NORMAN 1939). BRAUER mentions four finds at depths between 1,134 m and WEBER (1913) one from but as these two authors have not ed *L. niger* and *L. fragilis*, these values with certainty referable to *L. niger;* ll, however, almost entirely between its given by ALCOCK and LLOYD. The two specimens described by GARMAN (1899) as *L. illustris* from the Gulf of Panama were taken at a depth of 1,015 and 935 m respectively, and TROTTER (1926) has added two more specimens from the same area taken at 823 and 1,143 m, thus about at the same depths as in the Indian Ocean.

Contrary to all the other catches, the specimen mentioned by TROTTER (1926) from 823 m depth was not caught in gears towed at the bottom but in mid-water layers, and the specimen taken by the Swedish Deep-Sea Expedition and that obtained during the Danish »Dana» Expedition were both captured in mid-waters in plankton nets with 1,500 and 2,000 m of wire out respectively. These finds clearly indicate that *Lamprogrammus niger* (and probably also the other species of this genus) partly dwell pelagically. This question has been discussed more in detail on p. 281.

Hydrographical conditions. For the stations at which his two specimens were captured ALCOCK records a bottom temperature of +7.17° C. and +8.33° C. respectively; the corresponding values for GARMAN's specimens are +4.65° C. and +5.44° C. For the salinity no values are given in the literature as far as I can find.

Geographical distribution. *Lamprogrammus niger* was firstly discovered in the Indian Ocean by the »Investigator» researches at stations 112 (N 13° 47′ 30″ E 92° 35′, Bay of Bengal) and 116 (N 11° 31′ 40″ E 92° 47′ 06″, Andaman Sea). Later it was found in the same area off Dondra Head, Ceylon, (LLOYD 1907 b) and in the Maledive area, as well as in the Zanzibar area (NORMAN 1939). The records of the German »Valdivia» Expedition from off the east coast of Africa and the west coast of Sumatra are, for reasons given above, perhaps not entirely referable to this species and the same is the case with that of the Dutch »Siboga» Expedition from the Timor Sea.

As I have tried to show above, the specimens

from the Gulf of Panama, described by GARMAN as a distinct species *illustris*, cannot be distinguished taxonomically from *L. niger*, which consequently occurs also in this part of the Pacific. The known Pacific localities are: N 06° 30′ W 81° 44′ and N 07° 21′ W 79° 35′ (GARMAN 1899), N 04° 50′ W 87° (TROTTER 1926), N 07° 04′ W 78° 52′ (Swedish Deep-Sea Expedition) and N 07° 06′ W 79° 55′ (Danish »Dana» Expedition 1928—30). According to our present knowledge *L. niger* has consequently a discontinuous distribution, but as this species can dwell pelagically its possibilities of spreading over vast areas must be considerable. Probably it will be found in future in many localities between the two areas of distribution known at present.

Subfamily APHYONINAE

As stated above, p. 282, I have undertaken the provisional arrangement of putting together the genera *Aphyonus* GÜNTHER, *Sciadonus* GARMAN, *Barathronus* GOODE & BEAN and *Leucochlamys* ZUGMAYER as a new subfamily Aphyoninae, as they show many mutual similarities and in many respects differ from other Brotulids. As common characteristics may be mentioned a comparatively small body size, a thin, loose, scaleless skin without or with only very feeble pigmentation, strongly reduced eyes and bone tissue and a more or less persistent notochord; an opercular spine, characteristic of the typical Brotulids, is lacking.

These four genera may be distinguished according to the following key:

I. Mouth very oblique
Barathronus GOODE & BEAN

II. Mouth more or less horizontal
A. Lower jaw included, pectoral fins normal *Aphyonus* GÜNTHER
B. Lower jaw projecting, pectoral fins pedicellate
1. Ventrals present, skin without black pigment *Sciadonus* GARMAN
2. Ventrals absent, scattered pigment cells present
Leucochlamys ZUG

The Swedish Deep-Sea Expedition ob four specimens of this group of fish viously belonging to as many speci previously not described. Because rather poor knowledge of the anatomica liarities of these rather aberrant tele would have been of very great inter make them the object of a closer anat study, but as they are all type spe I think it better not to injure them by tion in the hope that more material available in the near future. Here sequently confine myself to giving a taxonomical characterization of our m

Genus **Barathronus** GOODE & BE

Barathronus erikssoni n. sp.
(Plate VII, figs. 1, 5, 7, Textfig. 47)

Material: St. 342 (Haul No. 4), N W 18° 40′ — N 00° 58′ W 18° 27′, Ju 1948; depth 5,250—5,300 m: 1 speci

An almost undamaged female speci this new species was obtained in the t St. 342, only the head has become so pressed (see Plate VII, fig. 5). On t served specimen I have taken the fo measurements in mm:

Total length	
Length of body	
Greatest height of body	
Length tip of lower jaw to ventrals	
Length tip of lower jaw to pectorals	
Length tip of lower jaw to dorsal	
Length tip of lower jaw to anal	
Length tip of lower jaw to anus	
Length of ventrals	a
Length of pectorals	
Length of dorsal	
Length of anal	
Length of caudal	ac

Textfig. 47. 1st right branchial arch of *Barathronus erikssoni* n. sp. Photo · 10.

of head	17	
of head	abt.	9
of snout	abt.	4
of upper jaw	7	
er of eye	abt.	2
bital width	abt.	2
r of rays in dorsal	86	
r of rays in anal	52	
r of rays in caudal	8	
r of rays in pectorals	24/24	
r of rays in ventrals	1	
r of gill-rakers on left 1st branchial arc	3+1+16+5	

comparison with the previously described ci of genus *Barathronus* I refer to Table

this table can be seen that *B. eriks-* s compared with the other species, has somewhat slenderer body and above all a nsiderably greater pre-anal length, more % of length of body, thus approaching embers of the genera *Sciadonus* and *dalamys* in these respects. On the other nd he large head with the very oblique cleft is quite in accordance with the members of the genus *Barathronus*. More- he pectoral fins are not pedicellate, though their basis is somewhat spatulate. beaks in favour of the view that the cies in question, at least at present, must rporated in the genus *Barathronus*. Be- s great pre-anal length, the number of dorsal and anal fin rays distinguishes it from all the previously described species of this genus.

There are no long gill-rakers on the 1st branchial arch (Textfig. 47); the upper part supports three much reduced rakers, while one is situated in the joint between the upper and the lower part, which latter has 21 rakers (16+5), those nearest the joint strongly curved and with small denticles.

The eyeballs are rather large but almost without black pigment (Plate VII, fig. 5); there is, however, a pigmented ring, probably a vestige of the pigment cell layer, in which the rest of the pigment has disappeared because of reduction, and moreover a rounded pigmented spot in the interior, obviously corresponding to the pigment mass described by BRAUER (1908, p. 163, Pl. 35, Fig. 11 rep.) in the eye of *Barathronus affinis* BRAUER. A closer examination of the structure of the eye is of course not possible without injuring the specimen; it can, however, be added that the weak pigmentation of the eye is caused by reduction during ontogenetic development as the embryos have rather well pigmented eyes (cf. below).

The specimen is a female. In the ovarial sacs there are, besides some small eggs, also a few apparently fully developed embryos with well marked eye pigment (Plate VII, fig. 1). The species is thus viviparous. Around the

anal and urogenital openings there is a thickening, bearing a very small finger-like appendage on each side of the genital opening and moreover an unpaired median fold (Pl. VII, fig. 7 a and b).

Bathymetrical distribution. As has been stated in more detail on p. 281, I consider the *Barathronus* species not as bottom fishes but as belonging to the pelagic fauna. Above all the very oblique mouth cleft, and the reduction of the black pigment in the eyes in the adult stage (but not of the eyes themselves!) are taxonomical features which seem to support this opinion. Its excellent state of preservation may further confirm the suspicion that the specimen was captured during the hauling up of the trawl. Perhaps its supposed dwelling in the upper water layers may stand in relation to the opinion that many female Brotulids, even those normally living at the bottom at great depths, seek higher water layers when bringing forth their young. The well developed eye pigment of the embryos speaks in favour of the opinion that the youngest stages live and grow up in the upper water layers penetrated, at least to some extent, by daylight.

Geographical distribution. The type and single specimen of *B. erikssoni* was taken in the southernmost part of the eastern North Atlantic, N 01° 03′ W 18° 40′. The other North Atlantic *Barathronus* species are *B. parfaiti* VAILLANT (it seems very doubtful to me whether the specimen described as *B. parfaiti* by ROULE 1919 really belongs to that species; c. f. below p. 314) from the eastern North Atlantic and *B. bicolor* GOODE & BEAN from the western North Atlantic. The two other species of this genus, *B. affinis* BRAUER and *B. diaphanus* BRAUER are according to our present knowledge confined to the Indian Ocean.

This species is named in honour of Dr. JOHN ERIKSSON, the Expedition's surgeon, who gave me excellent assistance in the preservation of the material obtained during our trawlin who contributed in many other respects biological collection work during the expe

Genus **Sciadonus** GARMAN

Sciadonus kullenbergi n. sp.

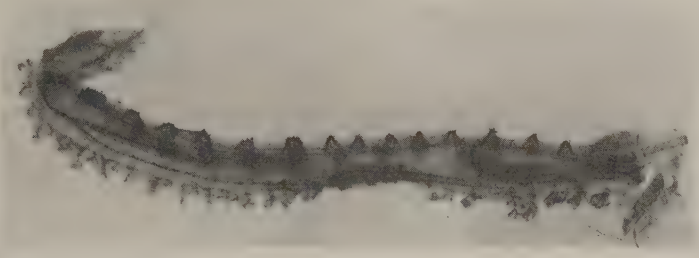
(Plate VII, figs. 2, 6, 8, Textfig. 48)

Material: St. 387 (Haul No. 13), N W 35° 24′—N 40° 34′ W 35° 52′, Sep 1948; depth 4,540—4,600 m: 1 specin

The specimen in question is in rather state of preservation. The preserved sp has the following dimensions in mm:

Total length	
Length of body	
Height of body at pectorals	
Height of body at anus	
Width of body at pectorals	
Width of body at anus	
Length tip of lower jaw to ventrals	
Length tip of lower jaw to pectorals	
Length tip of lower jaw to dorsal	
Length tip of lower jaw to anal	
Length tip of lower jaw to anus	
Length of head	
Height of head	
Width of head	
Length of upper jaw	
Length of ventrals	
Length of pectorals	1
Length of dorsal	
Length of anal	
Length of caudal	
Number of rays in dorsal	ab
Number of rays in anal	
Number of rays in caudal	
Number of rays in pectorals	
Number of rays in ventrals	
Number of gill-rakers on left 1st branchi arch	1+

This specimen agrees rather well with *nus pedicellaris* described and figured MAN (1899 p. 171—72, Plate F, fig. 4) in its general appearance but also



Textfig. 48. 1st right branchial arch of *Sciadonus kullenbergi* n. sp. Photo × 10.

ularities, for instance in the cushion-like ning at the symphysis of the lower jaw la VII, fig. 6), in the complete absence of gr nt in the skin and in the orange-red colour t larger eggs in the ovaries. The eyes are ly narked as very small black spots in the r of the transparent head. The number fi rays is also nearly the same; owing to the ct hat the dorsal fin has folded somewhat nd astened to the skin the number of its ys annot be counted with accuracy.

G MAN has not given any measurements xce for the total length, but judging from he companying painting the pre-dorsal length o specimen is much greater than in *S. llaris*, about 33 % of body length instead out 20 %; the pre-anal length is also om what greater, abt. 68.6 against 63.8 %. he edicellate basis of the pectoral fins is uc shorter than length of upper jaw (in *llaris* of about the same length). Moreover he ovaries extend forwards only to about id y between hindborder of operculum and nal pening. As in *Barathronus erikssoni* there a ir of finger-like appendages at the genital pening, but they are much longer, abt. 4 m length (Plate VII, fig. 8 a and b).

gill-rakers on the 1st branchial arch Text ig. 48) are reduced to very small triangular, enticulated structures, 1 on the upper art nd 13+3 on the lower part of the left , 10+3 on the right.

B thymetrical distribution. As already stated, *S. kullenbergi* was taken at a depth between 4,540 and 4,600 m, thus considerably deeper that the type of the genus, obtained at a depth of only 1,848 m.

Hydrographical conditions. Temperature and salinity at St. 387 (5 m above bottom) were + 2.38° C and 34.93 ‰ respectively.

Geographical distribution (Map, Textfig. 3). The type and single specimen hitherto known of *S. kullenbergi* was captured in the North Atlantic to the west of the Central Ridge, N 40° 33′ W 35° 24′. The type and single specimen of *S. pedicellaris* belong to the Eastern Pacific fauna, as it was taken at the U. S. »Albatross» St. 3365, N 05° 31′ W 86° 31′.

This new species is named in honour of Dr. B. KULLENBERG, who added much to the good results of our trawlings by his calculation upon the necessary length of wire for trawlings at great depths (KULLENBERG 1951).

Genus **Leucochlamys** ZUGMAYER

Leucochlamys jonassoni n. sp.

(Plate VII, figs. 3, 9)

Material: St. 329 (Haul No. 3), N 09° 38′ W 26° 20′—N 09° 50′ W 26° 30′, July 3rd 1948; depth 5,610—5,600 m: 1 specimen.

This specimen, which I consider as a new species of the genus *Leucochlamys* for reasons pointed out below, shows the following dimensions in mm:

Total length	43
Length of body	41
Height of body at pectorals	4
Height of body at anus	3.5
Width of body at pectorals	2.5
Width of body at anus	2
Length tip of lower jaw to pectorals	7
Length tip of lower jaw to dorsal	17
Length tip of lower jaw to anal	27
Length tip of lower jaw to anus	26.5
Length of head	6.5
Height of head	4.5
Width of head	3.5
Length of upper jaw	3
Length of pectorals	7(3.5+3.5)
Length of dorsal	25
Length of anal	14
Length of caudal	2
Number of rays in dorsal	68
Number of rays in anal	42
Number of rays in caudal	6
Number of rays in pectorals	9/9

The agreement between this specimen and the type and hitherto unique specimen of *Leucochlamys cryptophthalmus* ZUGMAYER is on the whole very great; in both the pre-dorsal length is abt. 41 % of body length, the pre-anal length abt. 64 %. There are, however, rather great differences regarding the number of rays in the fins. For the dorsal in *L. cryptophthalmus*, ZUGMAYER gives the number »env. 90»; I have counted 84 in his specimen against 68 in that taken by us. For the anal fin the corresponding values are »env. 60»; 46 and 42, and for the pectorals 15, 13 (only counted on the left pectoral) and 9. Especially the great difference regarding the number for the dorsal and the pectorals prevents me from regarding them as belonging to one and the same species.

The eyes are strongly reduced and, as in *Sciadonus kullenbergi*, only represented by two very small pigment bodies in the interior of the transparent head.

As in *L. cryptophthalmus* there are some scattered black pigment cells on the head the brain and backwards on both sides base of the dorsal fin. There are, ho moreover some scattered pigment cells the base of the anal and in a single row the septum between the dorsal and v body musculature (Plate VII, fig. 3).

The specimen in question is a femal some large, brownish-yellow eggs in the o which extend forwards through abou thirds of the body cavity on the left sid in the females of *Barathronus* and *Sci kullenbergi* there is a pair of appendages genital opening, the appendages being small in the specimen in question. Be them there is a protruding cone-like str possibly an evaginated portion of the u bladder (Plate VII, fig. 9 a and b). ZUG indicates the type specimen as »une f adulte aux ovaries remplis d'œufs». having seen the type specimen at Mo find this quite incomprehensible, and it be due to some mistake. The specimen strongly developed urogenital papilla, indicated on Fig. 4, Pl. VI by ZUGMAYER which must be a male papilla as it is different from the corresponding struct the three Aphyonine females described comparison between Fig. 10 a and b, after rough pencil sketches made by Monaco, and Fig. 9 a and b, Plate V. make this quite clear. Moreover I cou find any ovaries with eggs but instead o two gonads which seemed to me to be t microscopic section of a small piece of them proved the correctness of this s tion.

Bathymetrical distribu The single hitherto known specimen *jonassoni* was captured at a depth of 5,600 m and consequently belongs to t pest-living teleostean fishes; the type sp of *L. cryptophthalmus* was taken at a d 5,000 m.

drographical conditions. temperature of the bottom water at 29 was + 2.35° C and the salinity ‰.

ographical distribution (Map, g. 3). Both the hitherto known species *ucochlamys* were captured in the easterly basin of the North Atlantic. *L. cryptoph-* is more to the north, at N 44° 08′ 44′, *L. jonassoni* at N 09° 38′ W 26° 20′. species is named in honour of Mr. NASSON, the mechanic of the Swedish Sea Expedition, who had *inter alia* the sibility for the practical part of our ngs and to whom we are indebted for a ry good piece of work in this as well as in respects.

Gen. et spec. indet.

(Plate VII, figs. 4, 11)

aterial: St. 387 (Haul No. 13), N 40° 32′ W 5° 24′—N 40° 34′ W 35° 52′, Sept. 7th 98; depth 4,540—4,600 m: 1 specimen.

s small specimen has the following dimen- in mm:

length	29.5
of body	26
of body	3.6
tip of lower jaw to dorsal	15
tip of lower jaw to anal	18
of head	5.75
of upper jaw	abt. 1.5
of dorsal	11.5
of anal	8
r of rays in dorsal	48
r of rays in anal	34
r of rays in caudal	5
r of rays in pectorals	13/13

small specimen is obviously a juvenile the notochord is proportionately very nous, the caudal fin skeleton not fully developed and the gonads not visible. The eyes are represented by rather small pigment bodies, about as in *Sciadonus* and *Leucochlamys*, but they are proportionately much larger, perhaps also a juvenile feature. The head is rather large and the mouth cleft rather oblique. Both pre-dorsal and pre-anal length are considerable, abt. 58 and 69 % of body length respectively, thus greater than in any other known Aphyonine species. As far as I can see there are no ventral fins. Head and body transparent, but there is a layer of scattered black pigment cells on the dorsal surface of the alimentary canal, continuing backwards along the base of the anal fin. There is moreover a very fine black pigmentation on the fins around the tip of the tail as well as on the somewhat spatulate base of the pectorals.

Obviously belonging to the subfamily *Aphyoninae*, this specimen is not referable to any one of its genera hitherto known. The rather oblique mouth cleft excludes the possibility of placing it in any of the genera *Aphyonus*, *Sciadonus* or *Leucochlamys*. From the two last named genera it differs moreover in having the pectorals not pedicellate. The large head and the oblique mouth cleft recall considerably the conditions found in the genus *Barathronus*, but the ventrals are, as far as I can see, lacking, and the number of fin rays is much too small, for the dorsal 48 instead of 64 to 86, for the anal 34 instead of 50 to 65 and for the pectorals only 13 instead of 24 to 26 in all *Barathronus* species in which the number of fin rays is exactly known.

There is, however, an exception, namely *B. parfaiti* (VAILLANT). According to the original description this species has abt. 48 rays in the dorsal fin and abt. 40 in the anal; for the pectorals no number is given and ventrals are absent. This interesting but unfortunately badly preserved and consequently little known specimen, the type of *Alexeterion parfaiti* VAILLANT, consequently differs rather greatly from the other *Barathronus* species, and I think it

probable that this species when better known, will be removed from the latter genus and constitute a genus of its own, in which case the genus name *Alexeterion* would be valid again. *B. parfaiti* of ROULE (1919) with its fin formula D 70 A 63 P 26 is certainly not identical with VAILLANT'S species. It seems to be closely related to, perhaps identical with, *B. bicolor* GOODE & BEAN.

Because of the similarities in the num
dorsal and anal fin rays and in the abse
ventral fins I think it further not quite in
able that the juvenile specimen here
consideration will be revealed as a
parfaiti as soon as this species is better k
Because of this and of its juvenile stage,
for the moment desisted from erecting
genus and new species for it.

PART II: GENERAL

The composition of the deep-sea bottom-fish fauna

already mentioned in the »Introduction ...Station List» (NYBELIN 1951) the bottom fau- of the deep-sea, the largest faunal region o- the world, is one of the least investigated. Esp-cially our knowledge of the bottom-fishes f- depths greater than 3,660 m (2,000 fathoms) s itherto been very defective because of the almost exclusive use of comparatively small gear, dredges, sledge-trawls and beam-trawls of other small catching capacity.

An increased knowledge of the deep-sea bottom-fishes is of particular interest it seemed to be most desirable during the expedition to concentrate all our opportunities for zoological collecting work upon trawlings at depths greater than 4,000 metres with a 30-foot prawn-trawl, a gear considerably larger than those employed by earlier expeditions except the Norwegian »Michael Sars» Expedition in 1910.

Now that the treatment of the bottom-fishes obtained during the Swedish Deep-Sea Expedition is before us, we can compare the results of our trawlings regarding number of species and specimens with those of some earlier expeditions at corresponding depths and from that conclude in what degree our results answer to my intentions (Table XIX).

From this table may easily be seen that our 30-foot prawn-trawl has been much more effective than the gears previously employed so that consequently it has fulfilled my expectations. It must however be pointed out that not only the size of the gear but also the hours of our hauls, as a rule 4 hours, probably exceeded those of many of the earlier trawlings considerably.

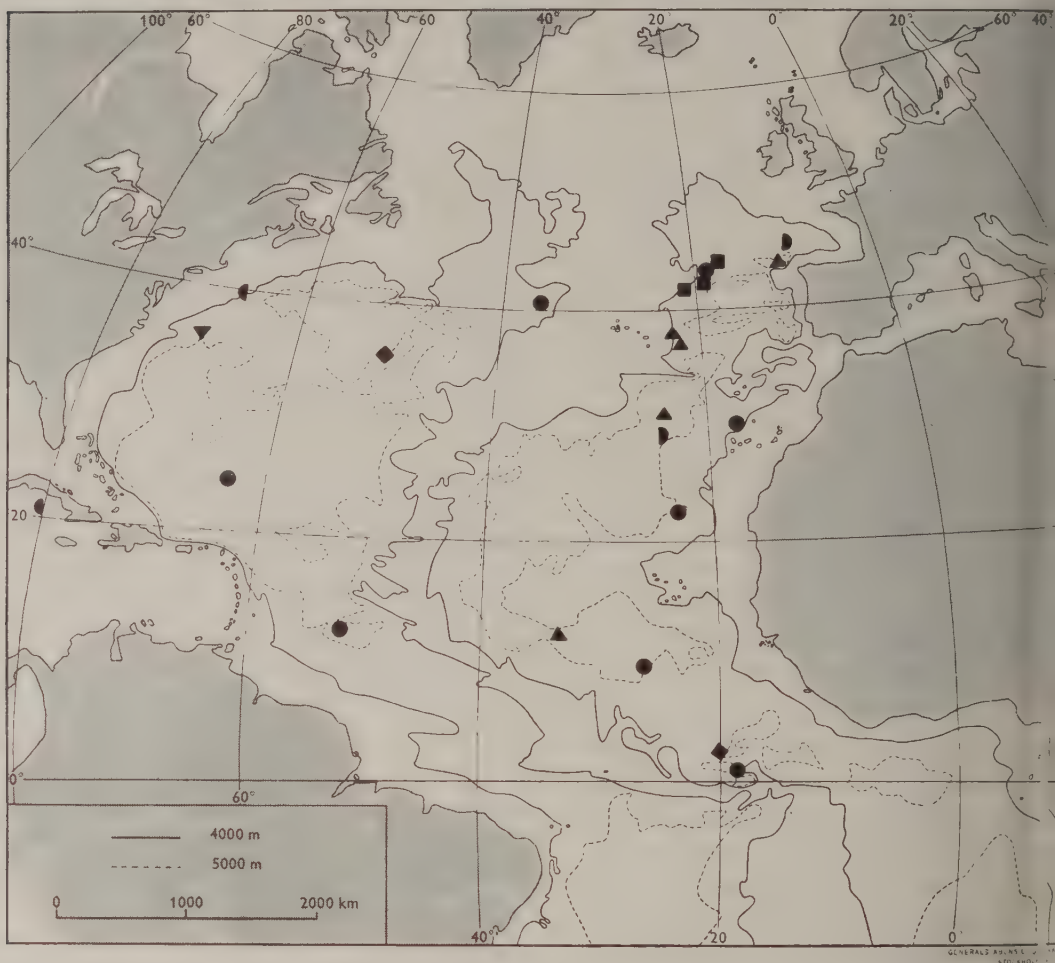
A more precise comparison between our results and those of earlier expeditions is gained if we compare only trawlings from the same area of investigation in which our expedition worked, viz. the North Atlantic. In Table XX I have listed all the bottom-fishes captured with trawls of various kinds below a depth of 3,660 m in that area according to my knowledge; the corresponding stations are plotted in on map Textfig. 49.

A comparison between our catches and those of the earlier expeditions shows consequently that we have obtained in 8 hauls 61 (?63) specimens of bottom-fishes belonging to 15 species against 23 specimens belonging to 16 species in the 15 previous hauls, i. e. nearly there times as many specimens in about half the number of hauls, which seems to be good evidence for the efficiency of the gear employed.

This increased material gives us, in my opinion, a quite new picture of the occurence and composition of the bottom-fish fauna at depths below 3,660 m.

In the earlier investigations at these depths the trawl never contained more than two fishes at a time (7 cases), if indeed any bottom-fishes were captured at all, and of the 16 species represented only two were taken in more than a single haul (*Nematonurus armatus* 5 times, *Bathypterois longipes* twice). Almost every time that a bottom-fish was brought up from those depths it proved to represent a new species. These results consequently gave rise to the opinion that the bottom-fish fauna at those depths was very poor in individuals but rather rich in species.

In our trawlings with the 30-foot prawn-



Textfig. 49. Trawlings with catches of bottom-fishes below a depth of 3,660 m in the North Atlantic by »Challeng
»Talisman» (■), U. S. »Albatross» (◖) »Princesse-Alice» (▲), »Michael Sars» (◗), »Atlantis» (▼), and the Swedish D
Expedition (●).

trawl we have repeatedly obtained specimens of the same species, most of them previously known; of our more than 60 specimens only three represent species not previously obtained (three) to which are to be added 8 (?10) specimens regarded as a new subspecies. Of the 9 species previously known only in a single specimen, we have obtained *Bathymicrops regis* three times in altogether 7 specimens, *Chalinura profundicola* twice in 4 and 2 specimens respectively, *Echinomacrurus mollis* once in 2 specimens, *Bassozetus taenia* twice in 2 and 4 specimens respectively and *Bassogigas profundissimus* twice, each time 1 specimen.

Besides this we also have got a specin
Barathrites iris, which like *B. abyssoru*
previously known only from a single spe
taken in a trap and is consequently not
in Table XX.

From the material now available we
quently may conclude that the botto
below 3,660 m is not as extremely poo
individuals as the results of previous inv
tions with gears of small capacity seer
show. On the other hand the number of
is in all probability much more restricte
hitherto supposed; with the use of only
trawls it was of course by mere chanc

mens of one and the same species would be red more than once.

is reasonably well grounded change in our on the composition of the bottom-fish at depths below 3,660 m is, in my m, the most important general result of rawlings.

garding the relative frequency of the us species of the named bottom-fishes the rial is, of course, too small to allow any ve conclusions. Nevertheless it seems to some indications.

e species far the richest in captured nens is the eurybathic *Bathypterois longi-* epresented in our material by no less than ecimens from four of eight stations, once in 11 specimens at a time. It is worth g that this species is one of the two hi was taken more than once by earlier itions and it must consequently be re- d as a relatively common species in the sea. The other species, *Nematonurus us*, previously taken no less than 5 times en 3,660 and 4,700 m and on many ons shallower, we got in two specimens one specimen respectively in both our shallower than 4,700 m. From that upwards it seems consequently to be evenly distributed.

next commonest species in our material *onurus carapinus* in the proposed new ecies *euabyssalis*, which was taken in 8, ps 10, specimens at four stations. Close comes *Bathymicrops regis* taken by us 3 in altogether 7 specimens (once 4 speci- in one and the same haul); together with iginal material it is now, like *Lionurus*, in 8 specimens from four localities. to the fact that it is of a small and r form, and may easily escape trough the s of the trawl, it may in reality be more on than what can be concluded from our gs. *Bassozetus taenia* has also proved rather common; including the original al it is at present known in 7 specimens from 3 different localities. The same is the case with *Chalinura profundicola*, which, however, seems to have a more restricted bathymetrical distribution as it has been taken only between 4,200 and 4,900 m. In this connection it is also worth noting that *Bassogigas profundissimus*, originally taken in a single specimen in the deepest haul before our expedition, 6,035 m, has been refound on the two next deepest trawlings, at 5,850 and 5,600 m respectively, on each occasion in a single specimen; this seems to indicate that it occurs, perhaps not commonly, but rather evenly distributed, at those depths. In our deepest haul, between 7,900 and 7,625 m, no bottom-fishes were obtained, which corresponds rather well with the results of the Danish »Galathea» Expedition, during which no bottom-fishes were captured below a depth of about 7,200 m.

2. The bathymetrical distribution of the deep-sea bottom-fishes

The euabyssal fauna

Before discussing this theme I will call attention to the fact, already treated in the »Introduction» (NYBELIN 1951, p. 9), that the depth statements of earlier expeditions may be considered as rather uncertain. It must therefore be kept in mind that all discussions regarding the bathymetrical distribution of deep-sea bottom animals are founded on a more or less unreliable basis. This need not, however, in my opinion prevent all discussion about these important questions, provided that one is fully aware of this uncertainty. Some authors have given their depth figures to the nearest ten metres in order to point out their unreliability, but as the error in most cases may probably be considerably greater than some few metres, I don't think that these figures give us a safer basis for which reason I have preferred to use the figures with which we are acquainted from the literature.

The vertical distribution of the bottom-fauna

of the sea has been the subject of many discussions and suggestions; nowadays a division into a shallow water or shelf fauna and a deep-sea fauna in the wider sense of the word seems to have been generally accepted. Regarding the limit between these two faunal regions and the subdivision of the latter, EKMAN (1953) p. 266 says in his standard work: »Zoogeography of the Sea»: »It is impossible to fix at a certain depth a generally valid boundary between the deep-sea fauna and that of the shelf. In nature, this boundary is quite indistinct and consists of a mixed or transitional region. Its position must be determined by reference to the distribution of the animal species and not primarily with regard to physical conditions such as the temperature or illumination. It must not be placed at the lower limit for the distribution of certain shelf animals or the upper limit for certain deep-sea animals if it does not also coincide with the level for the greatest faunal change. This level has only rarely been ascertained empirically. It lies at different depths in different regions (arctic and tropical ones, etc.). In general it would appear to lie between 200 and 400 m. depth. The fauna which has its main distribution below this boundary region we call deep-sea fauna. Within this fauna we can distinguish two faunistic zones, an upper zone on the slope from the outer edge of the shelf, containing the *archibenthal* fauna, and a lower zone, containing the *abyssal fauna*. The transitional region between the two is usually roughly placed at the 1000 m. level, and we have done so earlier in this book.

It must however be strongly emphasized that the drawing of a boundary around the 1000 m. depth is to a very high degree arbitrary and serves mainly practical purposes. Investigations into the position of the greatest faunal change seem not to have been undertaken and will have to wait until our knowledge of the deep-sea fauna is more complete. And it is an open question whether the boundary between the deep-sea sediments which after will be called hemipelagic and lagic would not be a more scientific z graphical boundary than the 1000 m. level.»

It has, however, been pointed out by authors that the abyssal fauna in this s not a homogeneous unit. Especially HJORT in his excellent and stimulating ment of the bottom-fish fauna in »The of the Ocean» has laid stress upon the fa there must exist a downward limit whe animal life becomes very poor and h tentatively drawn this limit at about the fathom line or about at the limit betwe slope and what at that time was calle abyssal plain. The experience of most de expeditions only confirms the idea tha bottom fauna at those depths is relatively in species as well as in individuals, pr principally owing to a very limited sup food, but systematic investigations by lings at depths immediately above and that level in one and the same area have ever been made. It is the great merit French expeditions in »Travailleur» and man» to have concentrated their investig to a rather restricted area, in their ca easterly North Atlantic. By using o whole the same gears and the same ca technique they have obtained a rather geneous and therefore very valuable m for the estimation of the faunal changes t the great depths. Much more must howe done in the same way and in various before we have the right to draw positiv clusions about this matter. The reaso I did not take up this problem durin Swedish Deep-Sea Expedition was firstly our expedition was, like most of the ones, an extensive expedition with a programme, in which the trawlings had fitted in with other investigations, and se that I thought it most desirable to empl technical resources to improve our de

dge of the animal life, especially the -fishes, at depths below the 2,000 line (of the 16 bottom-fish species exclusively below that depth only one en taken more than once at that time), it to future expeditions to make l investigations between 3,000 and a, which investigations can moreover be out without such extreme resources as s and winches.

Table XXIII I have listed, like the other treating the various groups of bottom collected during the Swedish Deep-Sea tion, all the finds of bottom-fishes from below 3,000 m known to me. From , however, I have excluded a few species red by some previous authors as true -fishes. For reasons given earlier (NY- 954) and on p. 281 I think it most likely ne *Barathronus*-species live pelagically. also in my opinion the case with the rs of the families Bathylaconidae and noberycidae. As earlier stated, the en identified by VAILLANT as ?*Sirembo toma* has proved to be not a Brotulid mall Macrouroid, probably a *Cetonurus*. *itopus metriostoma* (VAILLANT) must con- ly be eliminated from the list. Finally also excluded the young specimen taken »Michael Sars» St. 48, depth about n, and identified by KOEFOED (1927) as *ne intronigra* GOODE & BEAN, for the that this rather frequently captured has otherwise been taken only at depths n 413 and 1,798 m (at least 36 cases acc. literature) and that none of the other wn species of this genus has been stated deeper than 1,866 m. In my opinion it nost likely that the specimen in question t yet reached the bottom stage but had en living pelagically and captured during ling up of the trawl.

the 70 species listed in Table XXIII, *nurus abyssorum* GILBERT cannot be d in the following discussion because of the extremely wide amplitude of the depth value given for its capture, 2,470—3,993 m, which does not even allow the conclusion that it really lived below a depth of 3,000 m. The same is the case with the specimen of *Ericara salmonea* GILL & TOWNSEND from the same haul, which GILBERT has described as *Xenognathus profundorum;* for *Ericara salmonea* only the information as to the depth of 3,240 m can be employed in what follows.

An analysis of the 69 species under discussion (cf. the list on p. 340, Tab. XXI) reveals that not less than 34 species exist only above the 2,000 fathom line, which indicates that the bottom-fish fauna below that depth rapidly becomes relatively poor in species. As there is also, however, a successive dropping out of species with increased depth below this line, the limit may be considered as quite arbitrarily chosen. My reason for considering just this level as a dividing line is mainly based on the results of the »Talisman» Expedition, especially on the occurrence of the two species *Nezumia sclerorhynchus* and *Alepocephalus rostratus*, which seem to be rather common and which have often been captured. In the following table I have listed all the hauls of that expedition below a depth of 500 m together with the catches containing specimens of the two species just mentioned and

Depth in metres	Total number of hauls	With *Nezumia sclerorhynchus* (VAL.)		With *Alepocephalus rostratus* RISSO	
		Number of hauls	Number of specimens	Number of hauls	Number of specimens
500—1,000 ..	25	22	176	4	8
1,000—1,500 ..	27	18	143	4	8
1,500—2,000 ..	4	1	2	1	1
2,000—2,500 ..	16	6	13	4	6
2,500—3,000 ..	4	1	1	0	—
3,000—3,500 ..	1	1	3	0	—
3,500—3,660 ..	1	1	3	1	1
3,660—4,000 ..	1	0	—	0	—
4,000—4,500 ..	4	0	—	0	—
4,500—5,000 ..	1	0	—	0	—
5,000— ..	1	0	—	0	—

also the total number of specimens for each depth category.

This material is, of course, in itself too scanty to allow any decisive conclusions, but it is the far richest in this respect which I have been able to find in the literature. It must also be mentioned that these two species have been repeatedly obtained also by other expeditions and investigations, *Nezumia sclerorhynchus* at depths between 800 and 2,055 m, *Alepocephalus rostratus* between 900 and 1,800 m, but never at greater depths than those of the »Talisman» Expedition although the number of successful trawlings below 3,660 m in the North Atlantic, especially in its easterly part, amounts solely for the »Challenger», the »Princess-Alice» and the Swedish Deep-Sea Expeditions to about 40, rather evenly distributed according to depth at least down to 5,100 m. It is also worth noting that some other of the most abundant »slope» species have the lower limit of their bathymetrical distribution at about the same depth, *Macrourus berglax* at 3,422 m and *Synaphobranchus kaupi* at 3,465 m according to our present knowledge.

There seems consequently to be rather good reason for the opinion that there exists some kind of ecological limit at about the 2,000 fathom line. As far as I can see there are, however, neither any hydrographical conditions regarding temperature, salinity and oxygen content nor any differences as to the bottom substratum which could give an explanation of this fact. And in view of the not few eurybathic species which are to be found far below the limit in question it seems very unlikely that the water pressure in itself should be responsible for the change at just that depth. Consequently one must at present content oneself with the simple statement that there apparently exists a limit of rather great faunal change at about 3,660 m.

Going over to the bottom-fishes found below that limit, amounting according to the list on p. 340, Tab. XXI, to as many as 35 species, they must regarding their bathymetrical distribution be divided into two groups:

1) the species, 16 in number, which are not known to occur also above that limit, and

2) those, 19 in number, which have hitherto been obtained only below it.

Among the former, more or less eurybathic species I have also reckoned *Halosaurus rostratus*, originally taken at a depth of 5,[illegible] m; later, however, ROULE (1919) identified a specimen captured at only 1,311 m, near the Cape Verde Islands, as belong to this species. This identification, I think, needs confirmation, but for the present one must take it into consideration.

The eurybathic group needs, I think, a special analysis in this connection. This is however not the case with the extremely deep-stenobathic group. It is, of course, the most inadequately known, and it was because of this that I concentrated our efforts during the expedition on getting a better knowledge of it. Before our expedition there were known of this group althogether 16 species, all with the exception of *Typhlonus nasus*, obtained twice in the Pacific, taken only once each; among these 16 species I include the species of the new species *Chalinura profundicola* from St. 10 of the »Michael Sars» Expedition identified by KOEFOED (1927) as *Ch. bimaculata bis* GOODE & BEAN. Regarding species obtained only once, it may by thought to have been merely chance whether they have been to be captured above or below a certain depth level; a single find of course tells us nothing about the limits of the vertical distribution.

During our expedition, however, as I have mentioned in the foregoing chapter, we have covered of these species *Bathymicrops* [illegible] at three further stations in altogether 7 specimens, *Chalinura profundicola* on two occasions in 4 and 2 specimens respectively, *Echi[illegible]*

mollis once in 2 specimens, *Bassozetus* twice in 2 and 4 specimens respectively, *Bassozetus* (formerly *Grimaldichthys*) *prossimus* twice, at each station one specimen. ast these 5 species seem to constitute a of extremely deep-stenobathic bottom-. This is especially the case with *Bassogirofundissimus*, which has been taken in ie three deepest hauls in the North At- in which bottom-fishes have been ob- l, but in no others. To this may be added we got 8, perhaps 10, specimens belonging e species *Lionurus carapinus* but consider- s constituting a new subspecies named *ssalis*, at no less than four stations at is between 4,267 and 5,600 m; the known metrical distribution of the main species 11—3,120 m.

ause of the facts here mentioned I se a tentative subdivision of the abyssal in the wider sense into an upper abyssal above a depth of about 3,660 metres un euabyssal fauna below that limit. I that this limit is »determined by reference e distribution of the animal species» as ed by EKMAN. The euabyssal bottom- is composed of an eurybathic component of a stenobathic one, specific for this . Moreover the euabyssal fauna is charac- d, in comparison to the upper abyssal . by pronounced parsimony in species ll as in individuals, probably because of latively poor supply of food.

m, of course, fully aware that this sub- on is at present rather weakly founded hat future investigations may alter the sed limit or perhaps simply prove the e of a special euabyssal fauna. Above must also be examined with regard to thymetrical distribution of other groups thal animals besides the bottom-fishes. garding the facts now available it seems very probable that there really exists ked change in the composition of the n-fish fauna at a level of about 3,660 m, and because of this I have put forward this proposal in the hope that it will serve as a basis for further investigations.

The results obtained during the Swedish Deep-Sea Expedition seem to confirm the proposed arrangement. Our collection of deep-sea bottom-fishes has, as said in the foregoing chapter, augmented the material of these fishes rather considerably. It is then noteworthy that of the more than 60 specimens obtained during our trawlings, only a single specimen belongs to a species previously known only from depths above 3,660 m, namely *Barathrites iris*, formerly taken in a single specimen in a trap at a depth of 3,465 m. All the other specimens belong to species previously known as members of the euabyssal fauna, 5 in the eurybathic group and 9 in the stenobathic-euabyssal group, of which latter 3 species and 1 subspecies are described as new to science.

It must, however, lastly be strongly pointed out that the proposed creation of a distinct euabyssal bottom-fauna is mainly based on the results of the »Talisman» and the Swedish Deep-Sea Expeditions, and thus on the conditions prevailing in the North Atlantic, especially in its easterly part. It therefore seems not unlikely that there may exist other conditions in other Oceans or even in other parts of the Atlantic, the limit perhaps not being so pronounced or perhaps being situated at another level. Especially attention must be called to the fact that, in the Arctic and above all in the Antarctic parts of the Oceans, for species for which a low temperature is the dominant limiting factor the upper limit of the vertical distribution may be considerably moved upwards.

For the sake of surveyability I have listed the 69 species found below 3,660 m according to the above proposed grouping, the species of each group being arranged according to the lowest depth of their actually known distribution (Table XXI).

3. Geographical distribution of the euabyssal bottom-fish fauna

Regarding the geographical distribution of the bottom-fishes known to inhabit depths below 3,660 m there can be said very little at present, either, because of our very deficient knowledge. Of the 35 bottom-fish species hitherto taken below this depth 16 have also been found shallower; these species are in the preceding chapter designated as eurybathic. Of the 19 species known to live only below that limit, the stenobathic euabyssal species, not less than 12 have been captured only at a single station, which clearly shows how little is known in this respect.

Because of the very uniform ecological conditions in the deep-sea its fauna has been considered by many authors as on the whole cosmopolitan. This view seems to hold good for some animal groups. In his treatment of the asteroids of the Swedish Deep-Sea Expedition Jensenius Madsen (1951, p. 73) has pointed out »that the collection must be considered very important since it strongly stresses the supposition that the real deep-sea fauna is essentially cosmopolitan». On the other hand Ekman (1953 p. 291) says: »Not even for the most extreme abyssal species of the benthos can a cosmopolitan distribution, however, be considered as the rule. The lack of common species between the Atlantic and the other oceans may up to a point be due to the insufficient knowledge of the fauna, but this is only partly true. The fairly numerous deep-sea expeditions have shown that the same abyssal species are caught repeatedly in the Atlantic, and the same ones repeatedly in the Indian Ocean and Pacific, but it is much more seldom that the same species are caught in the Indian Ocean and the Atlantic, or in the Pacific and the Atlantic. Thus of the 18 elasiopods contained in the »Albatros» material from the Pacific only one species had been previously known from the Atlantic, but 10 from the Pacific».

Our present knowledge of the eu bottom-fishes seems to confirm this view. Of the more than 60 specimens o during the Swedish Deep-Sea Expedi the North Atlantic not a single one bel a species previously known only fro Indian or the Pacific Oceans. It must ever, be remembered that our knowle the bottom-fishes living at depths below m is still very deficient. It is to be hope the rich collections made by the »Galathea» Expedition in 1950—52 will published, contribute considerably to the sary basis for a more fruitful discussion respect. I therefore will here restrict to some few remarks founded on the m now at hand.

Regarding geographical distribution t components of the euabyssal bottom-fish must be treated separately.

Of the 16 species constituting the eury component of this fauna not less than hitherto known only from the Atlantic (*Rhinoctes nasutus*, *Bathypterois longipes sosauropsis rostratus*, *Cetonurus globiceps*, *nura simula*, *Barathrites iris*, *Parabas crassus*, *Bassogigas squamosus* and *M laticeps*), two are confined to the Pacific (*Chalinura liocephala* and *Bassogigas digi* whereas none is found in the Indian Ocea Three species are, however, common Atlantic and the Pacific (*Bathysaurus Ipnops murrayi* and *Synaphobranchus bius*, the last named hitherto found o the Antarctic part of the Atlantic), ar are found in all the three Oceans (*Li filicauda* and *Nematonurus armatus*, th mentioned, however, not yet found North Atlantic). Even if the species e in one Ocean are in a majority, there a already some species known to have or less cosmopolitan distribution. If we the thesis of Ekman (1953, p. 292) »t abyssal fauna cannot be divided i Atlanto-East-Pacific and an Indo-Wes

ion, but into an Atlantic and an Indo-pan-
region», the eurybathic euabyssal bot-
sh fauna contains no less than 5 cosmo-
1 species out of 16.

he stenoabthic euabyssal species none has
aptured in more than one Ocean. Of the
ies found more than once 6 have hitherto
aken only in the Atlantic (*Bathymicrops*
Lionurus carapinus euabyssalis, Echino-
us mollis, Chalinura profundicola, Basso-
rofundissimus and *Bassozetus taenia*) and
the Pacific (*Typhlonus nasus*), but none
Indian Ocean. Of the 12 species obtained
nce, 7 are confined to the Atlantic Ocean
cara obesa, Lycenchelys albus, Barathrites
rum, Porogadus abyssalis, Sciadonus kul-
i, Leucochlamys cryptophthalmus and *L.*
mi), 2 to the Indian (*Bathytyphlops sewelli*
assogigas brucei, which latter was errone-
ttributed to the Weddell Sea in NYBELIN
and 3 to the Pacific Ocean (*Bathytroctes*
epis, Bathypterois longicauda and *Alcockia*
z). Even if intensified collecting work,
all in the hitherto very little investigated
and Pacific Oceans, will without doubt
his picture considerably, it seems to me
xable that the eurybathic species obvi-
have better opportunities to spread over
reas and to become cosmopolitan.

ally some short remarks about the eua-
bottom-fish fauna of the North Atlantic
e added. This area was already before
pedition the one in which the majority
deep-sea trawlings had been carried out
ap. Textfig. 49) and, as said before (p. 315
able XX), our expedition has succeeded
olifying our knowledge of this area as to
ttom-fish fauna. Even if very much has
done before we can draw any conclusions
ny degree of accuracy, it may perhaps
some value to sum up what we know at
t, inasmuch as the results of the Danish
hea» Expedition will probably not con-
very much to our knowledge of the
Atlantic fauna.

In Table XXII I have tried to give an analysis of the known facts about the North Atlantic euabyssal bottom-fish fauna according to depths and regions. The main purpose is to establish whether there are any marked differences between the regions to the west and to the east of the Central Ridge, above all regarding the stenobathic euabyssal species.

Among the eurybathic species, which are partly cosmopolitan, it might *a priori* be expected that they are distributed over the whole North Atlantic. This is, however, the case only with the cosmopolitan *Nematonurus armatus* (see map, Textfig. 4). The Atlantic *Bathypterois longipes* (see map, Textfig. 2) is almost as widely distributed, but, as far as I know, has not yet been taken on the Easterly Atlantic Slope in spite of the many trawlings carried out there. *Cetonurus globiceps* on the other hand has been rather frequently found there, and moreover once in the Easterly Deep Basin but only once on the westerly side (PARR 1946, p. 46). These three species must consequently be supposed to be distributed over the whole of the North Atlantic. As to *Halosauropsis rostratus* there is some doubt about its nature in this respect; if the identification of this species as occurring in rather shallow water at the Cape Verde Islands is correct (cf. above), it belongs to this group, otherwise it must be placed together with the species only found in the Westerly Deep Basin.

Four eurybathic species show a pronounced westerly distribution, above all *Chalinura simula* (see map, Textfig. 5). *Barathrites iris* and *Rhinoctes nasutus*, however, have not yet been found on the Westerly Slope, but it must be remembered that both species have hitherto been taken only twice; the latter has been found on the Central Ridge and in the deep area of the Caribbean Sea but not yet in the Westerly Deep Basin proper. As regards *Ipnops murrayi* it has hitherto been taken in the North Atlantic

only on the Westerly Slope; the euabyssal finding places are situated in the South Atlantic and in the Pacific.

The remaining four eurybathic species are on the contrary more easterly as to their distribution [*Parabassogigas crassus*, *Mixonus laticeps* (see map, Textfig. 23), *Bathysaurus mollis* (see map, Textfig. 1) and *Bassogigas squamosus*]. The last mentioned species has not yet been found on the Central Ridge, but it must be remembered that this species, too, has hitherto been obtained only twice. Somewhat more remarkable is the fact that *Bathysaurus mollis*, like *Bathypterois longipes*, has not yet been captured on the Easterly Slope.

The stenobathic euabyssal species merit a greater interest than the foregoing eurybathic ones. For them the Central Ridge might be considered as a barrier, dividing the stenobathic euabyssal fauna into two areas, perhaps each with its own species. Unfortunately this group is still very unsatisfactorily known, and of the 13 species hitherto found not less than 7 have been taken only once and are therefore of no value for the solution of this problem. The fact that not less than 6 of them (*Pachycara obesa*, *Lycenchelys albus*, *Barathrites abyssorum*, *Porogadus abyssalis*, *Leucochlamys cryptophthalmus* and *L. jonassoni*) have been found in the Easterly Deep Basin, whereas only one (*Sciadonus kullenbergi*, to which perhaps also *Halosauropsis rostratus* may be added, cf. above) has been taken in the Westerly Deep Basin mainly indicates how much more intensely the investigations have been carried out in the Easterly Deep Basin. It is, however, worth noting that the species *Lionurus carapinus euabyssalis* (see map, Textfig. 11) and *Chalinura profundicola* (see map, Textfig. 6) seem to be rather common in that basin, for which reason it is somewhat surprising that they have not been obtained at all to the west of the Central Ridge. This may possibly indicate that there exist some species of this group confined to the Easterly Deep Basin. To them belongs perhaps also *Echinomacrurus mollis*, h taken only on two occasions.

In view of these facts it seems to me of a special interest that our expedition suc in finding again not less than three s each previously known only from the E Deep Basin in a single specimen, not only basin but also in the westerly one. The are *Bathymicrops regis* (see map, Text *Bassogigas profundissimus* (see map, Text and *Bassozetus taenia* (see map, Textfig. worth noting that the two last named belong to the deepest living of the eua bottom-fishes. These finds clearly sho the Central Ridge does not constitute an mountable barrier for all the steno eaubyssal bottom-fishes, and further inv tions will undoubtedly increase the num species with a similar distribution.

To explain this somewhat unexpected bution is at present not possible. There think, at least two possibilities. One perhaps the more plausible, is that the and young fishes of these species are bathyphilous as the adults, and that th consequently able in a bathypelagical st force the Central Ridge, probably insuf able for the adult fishes. Another pos may be that the general distribution o species is much wider than we know at p and that from the South Atlantic, perha from other Oceans via the South Atlanti have immigrated both into the Wester into the Easterly Deep Basin of the Atlantic. It must be left to future inv tions to solve this interesting question.

MS completed April 30th

Postscript: During a visit to burgh in June 1956 I had the oppo of seeing the type specimen of *Neo brucei* Dollo thanks to the kindness A. C. Stephen, Royal Scottish Muse could at once be stated that the sp shows in principle the same peculiariti

; the dentition on vomer, palatines and
nchials as the other species ascribed by
the genus *Bassogigas*. As can be seen
ıy rough pencil sketch reproduced here
g. 50), the basibranchial patches very
esemble those of *B. digittatus* (GARMAN)
xtfig. 25, p. 297), but the patches seem
still closer together. There is con-
tly no doubt that *N. brucei* really be-
) the genus *Bassogigas* as defined by me.

Textfig. 50. Sketch of the dentition in the mouth cavity of *Bassogigas brucei* (DOLLO).

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TAB. I. *Bathysaurus mollis* GÜNTHER. Some body proportions.

	Body length in mm	Length of body: Height of body	Height of body: Height of caudal peduncle	Length of body: Breadth of body	Length of body: Length of head	Snout to line across eyes: Interorbital space	Length of head: Horiz. diameter of eye	Length of body: Base of dorsal	Snout to dorsal: Base of dorsal
lenger», St. 281	152	12.66	2.00	11.90	4.16	1.85	6.35	5.15	1.83
. Deep-Sea Exp., St. 313	198	9.90	2.22	10.20	4.40	1.62	6.92	5.21	1.87
cesse-Alice», St. 753	abt. 340	8.50	2.00	10.88	4.36	1.72	7.18	5.15	1.89
lenger», St. 237	390	8.86	2.44	10.83	4.29	1.65	7.91	5.42	1.94
iael Sars», St. 53	412	9.16	2.14	9.80	4.38	1.56	7.24	5.57	1.99
»Albatross», St. 5684	438	7.80	—	abt. 9.0	4.50	—	7.50	—	—
sman», St. CII	504	10.08	—	10.08	4.42	—	7.60	—	—

TAB. II. *Bathypterois longipes* GÜNTHER. Some body proportions.

	Body length in mm	In % of body length											
		Length of head	Height of body	Height of caudal peduncle	Tip of lower jaw to pectorals	Tip of lower jaw to ventrals	Tip of lower jaw to dorsal	Tip of lower jaw to anal	Length of snout	Interorbital width	Length of base of dorsal	Length of produced ventral rays	Length of produced caudal rays
cesse-Alice» St. 527	66.5	27.82	(9.77)	6.01	24.06	40.60	45.11	60.15	8.27	8.64	18.05	30.08	—
. Deep-Sea Exp. St. 387:5	85	—	11.17	7.05	21.17	40.00	47.06	61.17	—	7.64	17.06	—	24.71
. Deep-Sea Exp. St. 387:6	113	25.66	12.39	6.64	23.01	37.16	46.90	58.41	7.52	7.96	15.93	30.09	26.55
. Deep-Sea Exp. St. 387:4	142	22.54	12.68	6.69	21.13	36.62	46.48	57.75	—	7.74	16.20	34.51	26.05
iael Sars» St. 53:1	144	26.39	13.88	7.29	23.61	38.19	46.52	58.33	8.33	8.33	15.27	48.61	47.92
iael Sars» St. 53:2	153	24.84	13.07	7.19	22.87	38.56	47.06	58.82	7.84	7.84	15.68	45.10	53.59
. Deep-Sea Exp. St. 387:3	153	23.53	12.42	7.19	22.22	39.22	45.75	60.78	—	7.84	15.03	39.21	32.02
. Deep-Sea Exp. St. 387:2	166	22.90	12.65	6.63	21.08	38.86	45.78	58.43	—	7.23	15.66	35.54	29.51
lenger» St. 325:1	166	25.90	13.25	6.92	24.09	37.65	48.49	60.84	8.13	8.43	17.11	39.76	—
. Deep-Sea Exp. St. 329:3	168	25.00	13.09	6.69	23.21	39.88	49.11	61.90	7.73	8.33	16.07	—	(60.00)
. Deep-Sea Exp. St. 329:2	169	—	13.01	7.10	22.48	40.24	49.11	63.31	7.69	8.28	17.15	—	69.82
. Deep-Sea Exp. St. 329:4	170	—	12.94	6.61	22.35	38.82	48.23	60.50	7.35	(7.64)	15.88	—	55.90
lenger» St. 325:2	175	25.71	14.86	7.14	22.86	36.00	49.14	60.00	8.00	8.29	16.57	39.43	—
. Deep-Sea Exp. St. 329:1	191	—	12.04	6.67	—	37.70	47.64	58.27	7.33	7.85	15.70	—	73.30
. Deep-Sea Exp. St. 313	192	23.96	12.50	6.51	21.35	36.98	47.92	57.81	7.55	7.81	15.63	—	40.62
Deep-Sea Exp. St. 401:2	193	24.87	12.95	6.74	22.80	38.86	47.67	59.58	7.77	8.03	17.09	60.10	51.81
Deep-Sea Exp. St. 387:1	198	23.23	13.99	6.82	21.72	37.37	46.97	58.08	7.10	7.58	15.91	43.43	37.37
Deep-Sea Exp. St. 401:1	203.5	25.06	13.26	6.88	22.11	38.82	47.17	59.46	7.86	8.35	17.69	66.34	52.58

TAB. III. *Bathymicrops regis* HJORT & KOEFOED. Some measurements and body proportions.

	Total length in mm	Body length in mm	Height of body in mm	D:o in body length	Length of head in mm	D:o in body length	Tip of lower jaw to ventrals in mm	D:o in body length	Tip of lower jaw to anus in mm	D:o in body length	Tip of lower jaw to dorsal in mm	D:o in body length	Tip of lower jaw to anal in mm	D:o in body length	Distance anal to caudal in mm
Swed. Deep-Sea Exp. St. 342: 1 ..	117	104	6.5	16.00	17.5	5.94	30	3.46	38	2.74	45	2.31	67	1.55	21.
Swed. Deep-Sea Exp. St. 342: 2 ..	109	97	7	13.86	16.5	5.88	29	3.34	34	2.85	42.5	2.28	65	1.49	19
Swed. Deep-Sea Exp. St. 342: 4 ..	108	96	6.5	14.77	16.75	5.73	28.5	3.37	34	2.82	41.5	2.31	64.5	1.49	17.
Swed. Deep-Sea Exp. St. 342: 3 ..	107	95.5	6.5	14.69	16.5	5.79	27.5	3.47	34	2.81	41	2.33	61.5	1.55	19.
Swed. Deep-Sea Exp. St. 363	—	95	6.5	14.61	—	—	28	3.40	33	2.88	39	2.44	61	1.55	19
»Michael Sars» St. 48	105	94.5	5	18.90	16	5.90	28	3.37	33	2.86	38.2	2.47	61	1.55	19
Swed. Deep-Sea Exp. St. 313: 2 ..	102	92	6	15.33	15.75	5.84	27	3.41	33.5	2.75	39	2.36	61	1.51	18
Swed. Deep-Sea Exp. St. 313: 1 ..	98	88.5	5.5	16.09	15.5	5.71	26	3.40	32.5	2.72	37.5	2.36	57	1.55	16

TAB. IV. *Nematonurus armatus* (HECTOR). Some body proportions.

	Length of head in mm	Length of head in % of body length	In % of length of head										
			Length snout to anal fin	Greatest depth	Length snout to orbit	Ventral length of snout	Diameter of orbit	Interorbital width	Length of upper jaw	Length of barbel	Base of 1st dorsal	Length snout to 1st dorsal	Length base of ventral to anal
»Michael Sars» St. 53 KOEFOED 1927 ..	73	—	—	89.04	26.02	—	21.92	26.02	—	—	32.88	121.91	—
Swed. Deep-Sea Exp. St. 313	94	18.88	35.14	86.17	26.59	14.36	19.15	25.53	37.23	14.90	26.60	111.70	82—98
»Michael Sars» St. 88 KOEFOED 1927 ..	95	—	—	91.58	26.32	—	18.95	26.32	—	16.84	33.68	123.16	—
Swed. Deep-Sea Exp. St. 313	101	20.12	36.25	84.16	26.24	13.86	18.32	24.75	36.63	14.85	26.73	111.88	73.27
»Michael Sars» St. 53 KOEFOED 1927 ..	115	—	—	—	25.22	—	20.87	24.35	—	—	31.48	—	—
»Talisman» VAILLANT 1888	116	—	—	75.86	25.86	—	20.70	27.59	—	—	—	—	—
»Michael Sars» St. 35 KOEFOED 1927 ..	121	—	—	92.56	30.58	—	19.83	26.45	—	15.70	35.54	132.23	—
»Michael Sars» St. 53 KOEFOED 1927 ..	138	18.65	—	96.38	26.09	—	19.57	25.36	—	15.22	32.61	126.09	—
»Michael Sars» St. 10 KOEFOED 1927 ..	140	—	—	103.57	25.00	—	17.14	28.57	—	17.86	32.14	117.86	—
Swed. Deep-Sea Exp. St. 387	143	17.38	38.88	125.87	25.17	13.99	17.48	26.92	40.56	15.39	27.27	135.66	117.48
»Michael Sars» St. 53 KOEFOED 1927 ..	146	—	—	102.74	25.34	—	18.49	26.71	+	15.07	30.14	121.92	—
According to PARR 1946		17–19	35–36	—	abt. 27	abt. 14	abt. 20	abt. 25	abt. 33	abt. 20	abt. 26	120—125	abt. 76

. Chalinura simula Goode & Bean, *Ch. leptolepis* (Günther), *Ch. profundicola* n. sp. and *Ch. brevibarbis* Goode & Bean. Comparison between some body proportions.

	Length of head in mm	Length of head in % of length of body	Length snout to anal fin in % of length of body	Greatest depth in % of length of head	Length snout to orbit in % of length of head	Median height of snout in % of length of head	Diameter of orbit in % of length of head	Interorbital width in % of length of head	Length of upper jaw in % of length of head	Length of barbel in % of length of head	Base of 1st dorsal in % of length of head	Length snout to 1st dorsal in % of length of head	Length base of ventral to anal in % of length of head	Length of produced ventral ray in % of length of head
mula														
Bean														
s» St. 88														
1927	53	20.0	—	70.19	26.79	—	17.92	26.23	—	24.53	28.30	117	—	—
ross» St. 2572	60	20.0	30.0	75.00	25.00	9.17	18.33	24.17	41.67	21.67	25.00	118	45.00	90.00
-Sea Exp. St.														
.....	65	20.0	31.4	75.38	26.36	11.53	17.70	24.62	44.61	22.30	23.08	117	58.46	75.38
s» St. 53														
1927	72	—	—	75.27	26.39	—	19.44	25.00	—	23.61	25.00	114	—	—
s» St. 53														
1927	78	20.0	—	76.93	26.93	—	17.96	24.36	—	24.36	21.80	115	—	—
s» St. 53														
1927	81	—	—	75.30	27.16	—	17.28	22.22	—	23.45	23.45	114	—	—
s» St. 88														
1927	86	—	—	77.90	26.74	—	18.60	23.83	—	23.25	27.90	115	—	—
s» St. 53														
1927	92	19.4	—	79.35	25.00	—	18.48	23.91	—	25.00	—	119	—	—
s» St. 53														
1927	121.5	19.8	—	85.60	25.10	—	16.87	23.04	—	27.98	—	116	—	—
» Parr 1946 .		19—23	30—35	65—70	25—27	8—11	17—18	21—25	42—46	20—25	26—29	115—120	45—50	85—105
otolepis														
)														
en, British														
Nat. Hist.) ...	95	—	—	78.94	25.26	9.47	16.84	22.10	45.26	15.79	26.32	122	66.32	96.84
ofundicola n.sp.														
s» St. 10	52	21.66	30.00	70.19	26.92	8.65	16.34	26.92	47.11	5.29	23.08	111.5	42.31	—
ea Exp. St. 313	64	—	—	73.44	26.63	7.81	17.19	28.12	46.88	—	25.00	115.6	46.88	—
ea Exp. St. 313	68	—	—	75.71	26.47	7.35	17.65	27.94	48.53	8.82	19.12	114.0	52.94	—
ea Exp. St. 313	92	—	—	82.61	26.09	7.61	16.30	26.09	48.91	8.70	23.37	113.0	57.61	—
ea Exp. St. 313	102	—	—	85.29	25.49	7.84	15.69	24.78	49.02	6.81	27.45	115.7	56.86	—
ea Exp. St. 319	131	20.22	32.87	91.60	26.72	8.40	12.98	27.10	48.09	9.16	22.14	119.9	60.31	70.23
ea Exp. St. 319	147	20.27	34.34	90.48	26.19	8.16	12.24	27.55	46.26	6.80	22.45	117.0	58.50	85.03
cibarbis														
Bean														
8	32	—	—	73.44	28.13	17.19	21.09	35.16	40.63	12.50	25.00	112.5	53.12	65.62
3	33	—	—	78.78	30.30	19.70	21.21	34.85	42.42	12.12	24.24	112.1	48.48	66.67
8	36	17.91	26.36	75.00	27.78	16.16	19.44	33.33	41.67	8.33	25.00	111.1	50.00	—
8	41	18.81	26.15	70.73	26.83	19.51	20.73	34.15	43.90	8.54	24.39	107.6	51.22	—
8	48	18.46	28.46	81.25	29.17	18.75	19.80	33.33	41.67	8.33	22.91	112.5	54.16	64.58
3	52	18.31	28.17	80.77	28.85	21.15	20.19	32.69	43.27	7.69	23.08	111.5	51.92	69.23
» St. 88	55	—	—	76.36	28.18	16.36	16.36	34.55	41.82	10.90	25.45	112.7	52.72	67.27
ss» St. 33396.	56	—	—	69.64	26.79	16.07	18.75	31.27	42.86	12.50	19.64	110.7	51.78	75.00
1	56	19.86	31.56	76.78	28.57	18.75	18.75	34.82	42.86	10.71	25.00	117.8	50.00	78.57
» St. 88	57	18.10	27.62	77.19	28.07	17.54	17.54	36.84	43.86	8.77	24.56	114.0	—	—
1	63	19.03	29.61	78.57	28.57	16.66	16.66	31.75	41.27	—	23.81	109.5	55.56	79.36
» St. 88	66	—	—	75.75	27.27	16.66	18.18	33.33	42.42	9.09	23.48	113.6	56.00	78.78
oss» St. 33449	69	18.90	28.22	77.54	26.09	15.80	17.39	31.87	43.47	13.04	23.19	114.5	50.72	—
» St. 101														
927	75	—	—	86.67	29.33	—	17.60	32.00	—	12.00	26.66	116.0	—	—
ss» St. 33449	77.5	—	—	74.84	27.10	16.77	16.13	30.32	41.29	10.97	24.52	108.4	55.48	—
Parr 1946 ..		abt. 20	abt. 30	80	abt. 28	abt. 16	abt. 16	30—32	44—45	8—10	abt. 25	110—115	50—55	75—80

TAB. VI. *Chalinura simula* GOODE & BEAN and *Ch. leptolepis* (GÜNTHER). Comparison between some body prop

	Total length: Length of head	Length of head: Distance isthmus to anus	Length of head: Tip of snout to eye	Length of head: Horiz. diameter of eye	Tip of snout to eye: Horiz. diameter of eye	Interorbital space: Horiz. diameter of eye	Postorbital part of head: Horiz. diameter of eye	Total length: Height of body at pectoral	Total length: Height of body at 1st dorsal	Height at 1st dorsal: Height at eye	Tip of snout to 1st dorsal: Base of 1st dorsal
Chalinura simula GOODE & BEAN											
Swed. Deep-Sea Exp. St. 387	abt.5.0	1.03	3.82	5.65	1.48	1.39	3.22	abt.7.2	abt.6.6	1.75	5.07
U. S. »Albatross» St. 2572.....	—	1.15	4.00	5.45	1.36	1.32	3.18	—	—	1.73	4.07
According to KOEFOED (1927)	4.76—	1.10—	3.72—	5.14—	1.36—	1.24—	3.00—	6.35—	5.91—	1.54—	4.12—
	5.17	1.24	3.99	6.24	1.65	1.46	3.69	7.37	7.12	1.86	5.30
Chalinura leptolepis (GÜNTHER)											
Type specimen B. M. (Nat. Hist.)	—	0.93	3.96	5.94	1.50	1.31	3.38	—	—	1.79	4.85

TAB. VII. *Chalinura profundicola* n. sp. Some measurements.

	»Michael Sars» St. 10	Swedish Deep Sea Expedition				
		St. 313				St. 319 Type specimen
Total length	240+	260+	293+	421+	470+	676
Length of body	—	—	—	—	—	648
Length snout to anal fin	72	94	105	152	172	213
Length isthmus to anus	47	abt. 55	abt. 74	abt. 92	abt. 110	abt. 138
Length anterior end of ventral fin base to origin of anal	22	30	36	53	58	79
Length snout to 1st dorsal	58	74	77.5	104	118	157
Length anterior margin of orbital cavity to 1st dorsal	44	60	64	84	98	132
Height of body at the eye	21	27.5	32	49	54	53
Height of body at the pectorals	36	46	50	74	83	116
Height of body at the 1st dorsal	36.5	47	51.5	76	87	120
Length of base of 1st dorsal	12	16	13	21.5	28	29
Distance 1st dorsal to 2nd dorsal	12	23	26.5	34	40	72
Length of head	52	64	68	92	102	131
Length of snout	14	17	18	24	26	35
Width of snout	12	14	16	19	21	26
Height of snout	4.5	5	5	7	8	11
Horizontal diameter of orbit	8.5	abt. 11	12	abt. 15	abt. 16	17
Interorbital width	14	18	19	24	25	35.5
Postorbital part of head	32	36	39	55	61.5	81.5
Length of upper jaw	24.5	30	33	45	50	63
Length of barbel	2.75	—	abt. 6	8	7	12
Length of produced ventral ray	—	—	—	—	—	abt. 92

TAB. VIII. *Lionurus carapinus* (GOODE & BEAN) and *L. c. euabyssalis* n. subsp. Comparison between some body proportions.

	Length of head in mm	In % of length of head								
		Greatest depth	Length snout to orbit	Ventral length of snout	Diameter of orbit	Interorbital width	Length of upper jaw	Length of barbel	Base of 1st dorsal	Length snout to dorsal
i urus carapinus (GOODE & BEAN)										
\ aael Sars» St. 53 KOEFOED 1927	31	70.97	32.26	19.35	19.35	32.26	35.50	12.90	20.97	119.7
\ aael Sars» St. 53	42	79.76	33.33	19.29	20.24	33.33	38.09	13.10	26.19	120.0
- aael Sars» St. 53	45	75.55	33.33	21.11	22.22	35.55	36.66	15.55	24.44	126.6
) hael Sars» St. 88	54.2	84.87	33.21	20.30	20.30	35.98	37.03	12.92	26.20	124.0
) hael Sars» St. 55	59	86.44	33.90	17.00	23.73	33.90	37.28	13.56	25.42	127.1
\ rding to PARR 1946	—	75—80	30—32	18—20	21—23	33—35	38—40	abt. 12	abt. 25	125—130
' urus carapinus euabyssalis n. subsp.										
s l. Deep-Sea Exp. St. 329	19	60.00	34.21	18.42	19.74	34.21	31.58	10.53	31.58	110.5
s l. Deep-Sea Exp. St. 319	41	73.17	31.71	19.51	21.95	32.93	34.15	14.63	29.27	115.8
s l. Deep-Sea Exp. St. 342 Type	44	77.27	34.09	20.41	20.41	34.09	34.09	14.77	28.40	111.3

TAB. IX. *Echinomacrurus mollis* ROULE. Some measurements.

	Type specimen according to		Sw. Deep-Sea Exp. St. 401	
	ROULE	the present author		
l length	375	365+	465+	428+
th snout to anus	72	70	89	97
th snout to anal fin	—	76	100	108
th isthmus to anus	—	33	42	41
th anterior end of ventral fin base to origin of anal	—	16	24	25
th snout to 1st dorsal	65	61	78	77
th anterior margin of orbital cavity to 1st dorsal	—	44	62	61
t of body at 1st dorsal	46	44	58	61
t of body at anus	44	36	46	50
h of body at anus	18	abt. 13	22.5	20
th of base of 1st dorsal	—	14	16.5	18
nce 1st dorsal to 2nd dorsal	—	33	38	31
h of head	56	56	74	74
h of head	30	29	36	35
h of snout	25	21	26	26
n ventral length of snout	—	16	abt. 23	abt. 23
ontal diameter of orbit	8	8.5	10	10.5
orbital width	—	(21)	35	35
rbital part of head	—	28	40	41
th of upper jaw	—	14	20	20
th of barbel	—	3	4	4
h of produced ventral ray	—	—	—	25

TAB. X. *Echinomacrurus mollis* ROULE. Some body proportions.

	Length of head in mm	In % of length of head										
		Length snout to anal fin	Greatest depth	Length snout to orbit	Ventral length of snout	Diameter of orbit	Interorbital width	Length of upper jaw	Length of barbel	Base of 1st dorsal	Length snout to 1st dorsal	Length base of ventral to anal
Type specimen acc. to ROULE 1919	56	—	82.14	44.62	—	14.29	—	—	—	—	116.07	—
Type specimen acc. to the present author	56	135.71	78.57	37.50	28.57	15.18	(37.5)	25.00	5.36	25.00	108.93	28.57
Swed. Deep-Sea Exp. St. 401	74	135.14	78.38	35.14	31.08	13.51	47.30	27.03	5.41	22.30	105.40	32.43
Swed. Deep-Sea Exp. St. 401	74	146.00	82.43	35.14	31.08	14.19	47.30	27.03	5.41	24.32	104.05	33.78

XI. *Barathrites iris* ZUGMAYER, *B. parri* n. sp. (= *B. iris* of PARR) and *B. abyssorum* ROULE. Comparison between some measurements and body proportions.

	Barathrites iris ZUGMAYER		*B. parri* n. sp. (= *B. iris* of PARR)	*B. abyssorum* ROULE, type
	Type	Sw. Deep-Sea Exp.		
length	241	—	253	abt. 267
h of body	221	208	233	abt. 243
t of body at anus	34	34	44	43
h snout to dorsal fin	40	39	50	50
h snout to anus	94	89	104	87
h snouth to anal fin	98	94	109	90
h of head	35	32	37.5	36
h snout to opercular spine	32	29.5	35	33
t of head	24	22	27	28
th of upper jaw	13	12	16	14
ontal diameter of eye	4	3.75	5.5	4.5
th of snout	8	7.5	9	8.5
orbital width	13.5	12	11.5	16.5
th of dorsal	180	170	190	203
th of anal	133	119	131	141
th of caudal	20	abt. 17	20	24
th of pectorals	abt. 24	abt. 27	abt. 26/abt. 25	30
th of outer ventral ray	10/abt. 10.5	abt. 11/abt. 10.5	abt. 13/abt. 13	abt. 15/abt. 15
th of inner ventral ray	abt. 15/abt. 12	abt. 14/abt. 13	abt. 17/abt. 17	abt. 19/abt. 20
ber of rays in dorsal	113	111	112	116
ber of rays in anal	83	81	82	84
ber of rays in caudal	8	8	8	8
ber of rays in pectorals	23	abt. 22/abt. 23	22/22	25/—
ber of gill-rakers on 1st branchial arch	4+6+6	4+5+6	4+6+0	3(?4)+6+6
% of body length:				
th snout to dorsal	18.10	18.75	21.46	20.58
th snout to anus	42.53	42.78	44.63	35.80
th snout to anal	44.34	45.19	46.78	37.03
th of head	15.84	15.39	16.09	14.81
th snout to opercular spine	14.48	14.18	15.02	13.58
ht of body at anus	15.39	16.36	18.88	17.70
ht of head	10.86	10.58	11.59	11.52
% of length of head:				
th of upper jaw	37.14	37.50	42.66	38.88
zontal diameter of eye	11.43	11.72	14.66	12.50
th of snout	22.85	23.44	24.00	23.61
orbital width	38.57	37.50	30.66	45.83
% of length snout to opercular spine:				
th of upper jaw	40.63	40.68	45.71	42.42
zontal diameter of eye	12.50	12.71	15.71	13.64
th of snout	25.00	25.42	25.71	25.76
orbital width	42.19	40.68	32.85	50.00

TAB. XII. *Bassozetus taenia* (GÜNTHER) and *B. oncerocephalus* (VAILLANT). Comparison between some measuremen body proportions.

	Bassozetus taenia (GÜNTHER)				*B. onc ceph* (VAILL
	Type	Swed. Deep-Sea Exp.			Ty
		St. 363: 1	St. 363: 2	St. 329: 1	
Total length	246 (Trev.)	278	128+	102	24
Length of body	239 (Trev.)	258	121	94	22
Height of body	23 (Trev.)	30	14.5	—	2
Length snout to dorsal	(34)	38	19	—	-
Length snout to anus	66	74	36	28	abt. 7
Length snout to anal	(68)	78	38	30	-
Length base of ventrals to anus	(36)	43	20	15	abt. 5
Length of head	38	43	23	17	4
Length of upper jaw	18	20	11	8.5	1
Length of snout	7.5	9	5	3.75	
Length of dorsal	—	222	99	—	-
Length of anal	—	181	82	—	-
Length of caudal	—	20	—	—	1
Length of pectorals	19.2	26	abt. 14	—	abt. 2
Length of ventrals	(34)	37	18	—	2
Number of rays in dorsal	138 (G.)	128	124	—	(abt.
Number of rays in anal	115 (G.)	106	103	—	-
Number of rays in caudal	—	8	8	8	-
Number of rays in pectorals	30 (G.) 25/28 (Trev.)	27/27	24/25	27/27	22/
Number of rays in ventrals	1/1	1/1	1/1	1/1	-
In % of body length:					
Height of body	9.62	11.63	11.98	—	11.
Length of head	15.90	16.67	19.00	abt. 18.0	17.
Length snout to dorsal	(14.23)	14.73	15.70	—	-
Length snout to anus	27.55	28.68	29.75	30.85	33.
Length snout to anal	(28.45)	30.23	31.40	31.91	-
Length base of ventrals to anus	(15.06)	16.67	16.53	15.95	22.
Length of ventrals	(14.46)	14.34	14.87	—	10.
In % of length of head:					
Length of upper jaw	47.37	46.51	47.83	50.00	47.
Length of snout	19.74	20.93	21.73	22.06	20.
In % of length base of ventrals to anus:					
Length of ventrals	(94.44)	86.05	90.00	—	46.

TAB. XIII. *Bassozetus taenia* (GÜNTHER) and *B. oncerocephalus* (VAILLANT). Number of gill-rakers on 1st branchi

	Number of		
	Short rakers on upper part	Long rakers	Short rak on lower
Bassozetus taenia Type (B. M.)	4	16	4
Bassozetus taenia St. 329: 1	4	17	4
Bassozetus taenia St. 329: 2	4	15	4
Bassozetus taenia St. 363: 1	5	16	4
Bassozetus taenia St. 363: 2	4	16	4
Bassozetus taenia St. 363: 3	4	16	4
Bassozetus oncerocephalus Type (Paris)	4	15	2

XIV. *Porogadus abyssalis* n. sp., *P. gracilis* (GÜNTHER), *P. subarmatus* VAILLANT, *P. nudus* VAILLANT, *P. melanocephalus* (ALCOCK), *P. trichiurus* (ALCOCK), and *Penopus microphthalmus* (VAILLANT). Comparison between some body proportions and counts.

	Body length in mm	Head in % of body length	Snout to anal in % of body length	Head in % of length snout to anal	Snout in % of length snout to anal	Lower jaw in % of length snout to anal	Height of head in % of length of head	Snout in % of length of head	Lower jaw in % of length of head	Number of pectoral fin rays	Number of gill-rakers
gadus abyssalis n. sp.											
Deep-Sea Exp. St.											
2 Type	209	16.47	33.97	49.30	15.49	30.99	51.43	31.44	62.86	19/19	3+14+8
gadus gracilis											
ÜNTHER)											
llenger» St. 184 Brit.											
is. (Nat. Hist.) Type	—	abt. 13.6	—	49.21	14.29	33.33	56.45	29.03	67.74	abt. 14	4+18+3
gadus subarmatus											
AILLANT											
sman» St. CI.											
?*nudus* Vaill.) Paris											
is.	135	15.93	33.33	47.78	13.33	33.33	60.45	27.91	69.17	16/17	4+17+?
sman» Göteborg Mus.	171	15.79	34.50	45.76	12.71	32.20	60.71	27.77	70.37	18/18	4+17+4
sman» Paris Mus. ..	173	14.74	31.79	46.36	12.73	31.82	64.71	27.45	68.62	17/16	4+17+3
sman» Paris Mus. ..	180	14.72	31.66	46.49	12.28	30.70	61.54	26.92	67.31	16/16	4+16+ca 3
sman» Brit. Mus.											
at. Hist.)	ca 184	14.67	32.60	45.00	12.50	31.67	62.96	25.93	70.37	—	?+16+?
sman» Paris Mus. ..	184	15.22	32.60	46.66	12.08	31.25	60.71	25.90	66.96	16/16	5+17+ca 4
sman» Paris Mus. Type	208	13.46	29.32	45.90	12.30	31.15	62.50	26.79	67.86	17/17	5+17+4
gadus nudus											
AILLANT											
sman» St. XCVIII											
ris Mus. Type	197	16.50	34.51	47.77	11.03	30.88	50.74	23.07	64.62	20/20	4+15+ca 6
gadus melanocephalus											
LCOCK)											
estigator» Brit. Mus.											
at. Hist.) Type	ca 190	ca 17.63	ca 34.75	ca 50.76	ca 15.15	ca 31.06	ca 56.72	ca 29.52	61.19	—	3+12+ca 3
gadus trichiurus											
LCOCK)											
Mus. (Nat. Hist.) ..	127	17.32	30.00	58.00	15.80	38.16	50.00	27.77	65.90	—	—
Mus. (Nat. Hist.) ..	130	17.30	31.54	54.88	17.07	36.58	57.78	31.11	66.66	—	—
Mus. (Nat. Hist.) ..	ca 172	—	—	48.15	14.81	33.33	61.54	30.77	69.23	—	4+18+?
pus microphthalmus											
AILLANT)											
sman» St. CI Paris											
is.	111	20.27	ca 42.70	47.87	17.00	27.66	44.44	35.55	57.77	—	—
sman» St. CI Paris											
is. Type	135	20.74	41.48	50.00	16.96	27.68	42.85	33.92	55.36	—	—
sman» St. CI Paris											
is.	142	20.07	39.80	50.44	15.93	29.20	38.60	31.58	57.89	—	—

TAB. XV. *Bassogigas digittatus* (GARMAN), *B. pterotus* (ALCOCK), *B. squamosus* (ROULE) and *B. profundissimus* (ROULE). Some measurements and counts.

Measurements in mm and counts	*Holcomycteronus digittatus* GARMAN Paratype No 28641.	*Neobythites* (*Bassogigas*) *pterotus* ALCOCK Paratype No 13046.	*Grimaldichthys squamosus* ROULE Type.	*Holcomycteronus digittatus* GARMAN KOEFOED (1927); type of *B. koefoedi* NYBELIN	*Grimaldichthys profundissimus* ROULE Type.	*Grimaldichthys profundissimus* ROULE NYBELIN (1951) Sw. Deep-Sea Exp. St. 329.	—	*Grimaldichthys profundissi-* Sw. Deep-Sea Exp. St. 371
Total length	—	—	—	310	223	245		
Length of body	298	262	257	276	192	213		1
Height of head	45	36	39	43	—	—		
Height at base of pectorals	50	42	44	49	—	—		
Height at 1st dorsal ray	55	45	abt. 45	53	30	33		
Height at anus	abt. 46	41	46	49	—	—		
Height at base of caudal	3.25	3	3	3.25	2.5	2.75		
Length snout to dorsal	76	60	66	66	47	51		
Length snout to anal	139	115	119	125	78	97		
Length snout to anus	126	109	108	120	75	94		
Length of head	60	51	54	56	37.5	44		
Length snout to tip of opercular spine	59	49	50.5	54	35	41		
Length of upper jaw	31	26	—	30	21	22.5	abt.	
Length of snout	18	11	11.5	14	10	11.5		
Interorbital width	21	17	16	19	14	17		
Horizontal diameter of eye	6	6.5	6	7	3	3.5		
Length of base of dorsal	231	209	195	216	148	163		
Length of base of anal	171	151	144	157	112	116		
Length of caudal	—	—	—	34	31	32		
Length of pectorals		abt. 77	46	63	56	—		(4.
Length of outer ventral ray	18/18	19/—	19.5/—	20/20	20/21	22/22		1 6
Length of inner ventral ray	15/15	16/—	17/16.5	—/18	14/14	17/17		1 2
Number of rays in dorsal	abt. 124	128	110	111	111	110		
Number of rays in anal	abt. 104	100	86	86	89	85		
Number of rays in caudal	8	8	—	8	8	8		
Number of rays in pectorals	17/17	21/20	21	20/20	15/—	—		
Number of gill-rakers on 1st left branchial arch	4+1+7+7	4+1+8+8	4+1+9+7	4+1+8+8	4+1+8+8	4+1 - 8 - 6	4+1	
Sex	♂				♂	♀		

TAB. XVI. *Bassogigas digittatus* (GARMAN), *B. pterotus* (ALCOCK), *B. squamosus* (ROULE) and *B. profundissimus* (ROULE). Comparison between some body proportions.

Dimensions in % of body length	*Holcomycteronus digittatus* GARMAN Paratype No 28641.	*Neobythites (Bassogigas) pterotus* ALCOCK Paratype No 13046.	*Grimaldichthys squamosus* ROULE Type.	*Holcomycteronus digittatus* GARMAN KOEFOED (1927); type of *B. koefoedi* NYBELIN	*Grimaldichthys profundissimus* ROULE Type.	*Grimaldichthys profundissimus* ROULE NYBELIN (1951) Sw. Deep-Sea Exp. St. 329	*Grimaldichthys profundissimus* ROULE NYBELIN (1951) Sw. Deep-Sea Exp. St. 371
of body at dorsal	18.46	17.17	17.51	19.20	15.63	15.49	14.92
t at base of caudal	1.09	1.14	1.17	1.17	1.30	1.29	1.24
n snout to dorsal	25.50	22.90	25.68	23.91	24.48	23.94	23.76
n snout to anal	46.64	43.82	46.30	45.29	40.62	45.54	42.54
n snout to anus	42.28	41.60	42.02	43.47	39.06	44.13	40.88
n of head	20.13	19.46	21.01	19.93	19.53	20.66	—
n snout to tip of opercular e	19.80	18.70	19.65	18.84	18.93	19.25	17.96
n of upper jaw	10.40	9.92	—	10.87	10.94	10.80	11.05
n of snout	6.04	4.20	4.47	5.07	5.21	5.40	5.25
rbital width	7.05	6.49	6.23	6.88	7.92	9.33	8.29
ntal diameter of eye	2.01	2.48	2.33	2.53	1.56	1.64	1.52
n of base of dorsal	77.51	79.77	75.87	78.26	77.08	76.53	76.80
n of base of anal	57.38	57.63	56.03	56.88	58.33	54.46	59.12
n of outer ventral ray	6.04	7.25	7.59	7.25	10.94	10.33	8.84
n of inner ventral ray	5.03	6.11	6.61	6.52	7.29	7.98	6.63

TAB. XVII. *Lamprogrammus niger* ALCOCK. Some measurements, counts and body proportions.

	Lamprogrammus niger ALCOCK					*L. illustris* according to GARMAN
	»John Murray« Exp. St. 143	»Investigator« Brit. Mus., Type	Sw. Deep-Sea Exp. St. 41: II	Da. »Dana« Exp. St. 3548: III	according to ALCOCK	
h of body	abt. 375	285	275	203	—	—
t of body	65	53	49	39	—	—
h snout to dorsal	75	—	54	41	—	—
h snout to anal	134	—	94	73	—	—
h of head	79	61	60	45	—	—
h of snout	20	—	15.5	13	—	—
h of upper jaw	37	—	27	20	—	—
eter of eye	abt. 9	—	7	5.5	—	—
orbital width	26	—	22	18	—	—
ber of rays in dorsal	106	—	107	107	abt. 110	112
ber of rays in anal	85	—	85	79	abt. 90	88
ber of rays in pectorals	17/17	—	17/17	17/—	17	16—18
% of body length:						
t of body	abt. 17.33	18.60	17.89	19.21	< 20	abt. 20
h snout to dorsal	abt. 20.0	—	19.64	20.20	—	—
h snout to anal	abt. 35.75	—	34.18	35.96	—	—
h of head	abt. 21.0	21.40	21.81	22.16	abt. 20	abt. 20
% of length of head:						
h of snout	25.31	—	25.83	28.88	abt. 25	abt. 26
h of upper jaw	46.83	—	45.00	44.44	abt. 50	abt. 43
eter of eye	abt. 11.4	—	11.66	12.22	abt. 11—12.5	abt. 12.5
orbital width	32.91	—	36.66	40.0	—	abt. 37.5

TAB. XVIII. *Barathronus erikssoni* n. sp. and the other *Barathronus* species hitherto described. Comparison betwe body proportions and number of fin rays.

	Length of body in mm	In % of body length				Number of rays i		
		Height of body	Length of head	Length snout to dorsal	Length snout to anal	dorsal	anal	pectorals
Barathronus erikssoni n. sp. Sw. Deep-Sea Exp. St. 342	78	13.46	20.51	41.62	62.82	86	52	24/24
Barathronus parfaiti (Vaillant) »Talisman» St. CXXXVII. According to Vaillant (1888)	42	16.66	16.66	(48.18)	(51.81)	abt. 48	abt. 40	—
Barathronus parfaiti (Vaillant) »Princesse-Alice» St. 698 According to Roule (1919)	117	15.38	19.65	47.00	53.00	70	63	26
Barathronus bicolor Goode & Bean »Blake» St. LXXI. According to Goode & Bean (1895)	120	15.83	(19.38)	45.00	(53.75)	70	57	—
Barathronus diaphanus Brauer »Valdivia» St. 259. According to Brauer (1906)	124	18.15	18.55	45.16	52.42	64	50	25
Barathronus diaphanus Brauer »Siboga» St. 300. According to Weber (1913)	59	18.64	23.73	44.07	55.93	—	—	—
Barathronus affinis Brauer »Valdivia» St. 220. According to Brauer (1913)	48	14.58	16.66	39.58	47.92	76	65	22

TAB. XIX. Trawlings at depths below 3,660 m by various expeditions.

Expedition	Total number of hauls	Number of sucessful hauls	Number of hauls with bottom-fishes	Number of bottom-fish species	Nu of bo spe
»Challenger»	53	37	10	14	
»Talisman»	6	6	3	3	
U. S. »Albatross» (up to 1900)	(22)	(19)	2	2	
»Princesse-Alice»	37	23	5	7	
»Michael Sars»	4	2	2	3	
»Scotia»	—	—	1	1	
»John Murray»	4	2	1	1	
»Atlantis»	—	—	2	3	
Swed. Deep-Sea Exp.	14	9	8	15	

ABLE XX. List of bottom-fishes taken by trawlings below a depth of 3,660 m in the North Atlantic. (cfr. map, Textfig. 49).

...n	Stat. No.	Position		Depth in m	Temp. in °C	Nature of bottom	Bottom-fish species (number of specimens in brackets)
		Lat. N	Long. W				
.....	63	35° 29′	50° 53′	5,032	—	Globigerina ooze	*Halosauropsis rostratus* (1)
.....	104	02° 25′	20° 01′	4,575	+2.56	Globigerina ooze	*Bassozetus taenia* (1) *Mixonus laticeps* (1)
.....	133	42° 15′	21° 17′	3,975	+3	Vase blanchâtre	*Lycenchelys albus* (2)
.....	135	43° 15′	19° 20′	4,165	+2.9	Vase blanchâtre	*Nematonurus armatus* (1)
.....	136	44° 20′	17° 11′	4,255	+3	Vase blanchâtre	*Nematonurus armatus* (1) *Parabassogigas crassus* (1)
oss» ...	2225	36° 05′ 30″	69° 51′ 45″	4,596	+2.6	Yellow ooze	*Bathypterois longipes* (1)
ice» ...	527	38° 09′	23° 15′ 45″	4,020			*Bathypterois longipes* (1) *Nematonurus armatus* (1)
ice» ...	652	36° 55′	22° 22′ 45″	4,261		Vase blanche à foraminifères	*Cetonurus globiceps* (2) *Bassogigas squamosus* (1)
ice» ...	1173	12° 07′ 30″	33° 32′ 45″	6,035		Argile rouge	*Bassogigas profundissimus* (1)
ice» ...	1787	31° 07′	24° 03′	5,413		Vase (globigérines)	*Echinomacrurus mollis* (1)
ice» ...	2994	44° 08′	10° 44′	5,000		Vase à globigérines	*Leucochlamys cryptophthalmus* (1)
.....	10	45° 26′	09° 20′	4,700	(+2.6)		*Nematonurus armatus* (1) *Chalinura profundicola* (1)
.....	48	28° 54′	24° 14′	abt. 5,000			*Bathymicrops regis* (1)
.....	—	39° 50′	66° 50′	3,705			*Nematonurus armatus* (1) *Chalinura simula* (1)
.....	2966	20° 47′	80° 24′	3,886			*Rhinoctes nasutus* (1)
a Exp.	313	29° 48′	17° 39′	4,267—4,255	+2.42	Yellowish Globigerina ooze	*Bathysaurus mollis* (1) *Bathypterois longipes* (1) *Bathymicrops regis* (2) *Chalinura profundicola* (4) *Lionurus carapinus euabyssalis* (1) *Nematonurus armatus* (2) *?Mixonus laticeps* (1)
a Exp.	319	22° 31′	23° 28′	4,872—4,867	+2.45	Yellowish Globigerina ooze	*Chalinura profundicola* (2) *Lionurus carapinus euabyssalis* (1)
a Exp.	329	09° 38′	26° 20′	5,610—5,600	+2.35	Calcareous red clay	*Bathypterois longipes* (11) *Lionurus carapinus euabyssalis* [5(??)] *Bassozetus taenia* (2) *Bassogigas profundissimus* (1) *Leucochlamys jonassoni* (1)
a Exp.	342	01° 03′	18° 40′	5,250—5,300	+2.28	Fairly loose, argillaceous Globigerina ooze	*Bathymicrops regis* (4) *Lionurus carapinus euabyssalis* (1) *Porogadus abyssalis* (1)
a Exp.	363	12° 22′	52° 00′	5,044—5,033	(+1.65)	Greyish brown clay	*Bathymicrops regis* (1) *Barathrites iris* (1) *Bassozetus taenia* (4)
a Exp.	371	24° 12′	63° 23′	5,850—5,860	+2.06	Red clay	*Bassogigas profundissimus* (1)
Exp.	387	40° 33′	35° 24′	4,540—4,600	+2.38	Argillaceous Globigerina ooze	*Bathypterois longipes* (6) *Chalinura simula* (1) *Nematonurus armatus* (1) *Sciadonus kullenbergi* (1)
Exp.	401	43° 40′	18° 45′	5,000—5,025	+2.71	Volcanic Globigerina ooze	*Bathypterois longipes* (2) *Echinomacrurus mollis* (2)

TAB. XXI. List of bottom-fishes found below 3,000 m. Number in brackets = number of records.

A. Species not known to occur below 3,660 m.

Alepocephalus, fundulus Garman	2 324—3 060 m	(2)
Lionurus carapinus Goode & Bean	1 211—3 120	(35)
Bathysaurus ferox Günther	1 800—3 120	(11)
Grenurus flagellicauda (Koefoed)	3 120	(1)
Halosauropsis macrochir (Günther)	1 106—3 167	(>37)
Chalinura brevibarbis Goode & Bean	1 569—3 167	(11)
Synaphobranchus infernalis (Gill)	2 615—3 167	(5)
Bassogigas pterotus (Alcock)	1 830—3 198	(3)
Porogadus melanocephalus (Alcock)	3 008—3 198	(2)
Bassozetus oncerocephalus (Vaillant)	3 200	(1)
Porogadus subarmatus Vaillant	3 200	(1)
Ericara salmonea Gill & Townsend	3 240	(1+1)
Malacocephalus suborbitalis Gill & Townsend	3 240	(1)
Acanthonus spinifer Garman	3 242	(1)
Paraliparis fimbriatus Garman	3 242	(1)
Nematonurus lecointei (Dollo)	2 792—3 248	(3)
Lycenchelys antarcticus Regan	3 248	(1)
Porogadus longiceps Garman	245—3 281	(4)
Paraliparis latifrons Garman	3 281	(1)
Bathytroctes alvifrons Garman	2 488—3 311	(2)
Lionurus fragilis Garman	3 060—3 336	(2)
Careproctus longifilis Garman	3 336	(1)
Benthosaurus grallator Goode & Bean	2 812—3 385	(2)
Macrourus berglax Lacépede	180—3 422	(many)
Coryphaenoides altipinnis (Günther)	1 034—3 431	(2)
Polyacanthonotus challengeri (Vaillant)	2 973—3 431	(2)
Parabassogigas grandis (Günther)	3 431	(1)
Bassozetus nasus Garman	3 059—3 438	(3)
Leucicorus lusciosus Garman	3 438	(1)
Synaphobranchus kaupi Johnson	692—3 465	(many)
Bassozetus normalis Gill	1 969—3 513	(4)
Nezumia scelrorhynchus (Valenciennes)	540—3 655	(57)
Alepocephalus rostratus Risso	830—3 655	(46)
Rouleina attritus (Vaillant)	1 615—3 655	(8)

B. Species found below 3 660 m (euabyssal spe

1. Eurybathic euabyssal species.

Synaphobranchus bathybius Günther	2 516—3 7
Chalinura liocephala (Günther)	3 431—3 7
Rhinoctes nasutus (Koefoed)	2 865—3 8
Ipnops murrayi Günther	1 464—3 9
Bassogigas digittatus (Garman)	2 197—4 0
Parabassogigas crassus (Vaillant)	1 797—4 2
Cetonurus globiceps (Vaillant)	1 139—4 2
Bassogigas squamosus (Roule)	2 603—4 2
Bathysaurus mollis Günther	2 615—4 3
Chalinura simula Goode & Bean	609—4 5
Mixonus laticeps (Günther)	2 615—4 5
Nematonurus armatus (Hector)	281—4 7
Lionurus filicauda (Günther)	2 516—4 8
Halosauropsis rostratus (Günther)	1 311—5 0
Barathrites iris Zugmayer	3 465—5 0
Bathypterois longipes Günther	? 826—5 6

2. Stenobathic euabyssal species.

Bathytyphlops sewelli (Norman)	3 840—3 8
Alcockia rostrata (Günther)	3 9
Bathytroctes macrolepis Günther	3 9
Lycenchelys albus (Vaillant)	3 9
Typhlonus nasus Günther	3 934—4 4
Bassogigas brucei (Dollo)	4 5
Sciadonus kullenbergi n. sp.	4 540—4 6
Bathypterois longicauda Günther	4 6
Pachycara obesa Zugmayer	4 7
Chalinura profundicola n. sp.	4 267—4 8
Leucochlamys cryptophthalmus Zugmayer	5 0
Bathymicrops regis Hjort & Koefoed	4 267—5 2
Barathrites abyssorum Roule	5 2
Porogadus abyssalis n. sp.	5 250—5 3
Echinomacrurus mollis Roule	5 025—5 4
Lionurus carapinus euabyssalis n. ssp.	4 267—5 6
Bassozetus taenia (Günther)	4 575—5 6
Leucochlamys jonassoni n. sp.	5 600—5 6
Bassogigas profundissimus (Roule)	5 610—6 0

XII. Bathymetrical and zoogeographical distribution of the euabyssal bottom-fish fauna in the North Atlantic

Species	Westerly slope down to 3660 m	Westerly deep basin	Central ridge shallower than 3660 m	Easterly deep basin	Easterly slope down to 3660 m
Eurybathic:					
murus armatus	+	+	+	+	+
terois longipes	+	+	+	+	—
rus globiceps	+	—	—	+	+
uropsis rostratus	—	+	—	—	?
ara simula	+	+	+	—	—
rites iris	—	+	+	—	—
tes nasutus	—	(+)[1]	+	—	—
murrayi	+	—	—	—	—
ssogigas crassus	—	—	+	+	+
us laticeps	—	—	+	+	+
aurus mollis	—	—	+	+	—
igas squamosus	—	—	—	+	+
Stenobathic euabyssal:					
us kullenbergi	—	+	—	—	—
icrops regis	—	+	—	+	—
igas profundissimus	—	+	—	+	—
tus taenia	—	+	—	+	—
ara obesa	—	—	—	+	—
helys albus	—	—	—	+	—
us carapinus euabyssalis	—	—	—	+	—
macrurus mollis	—	—	—	+	—
ra profundicola	—	—	—	+	—
ites abyssorum	—	—	—	+	—
dus abyssalis	—	—	—	+	—
damys cryptophthalmus	—	—	—	+	—
damys jonassoni	—	—	—	+	—

[1] bbean sea, depth 3,886 m.

TAB. XXIII. List of bottom fishes found below 3,000 m.

	Depth in m	Locality	Expedition	Author	Other records	
					Number	Depth in m
Fam. Alepocephalidae						
Alepocephalus rostratus Risso	3,650	N 15° 48′ W 20° 23′	»Talisman» St. CII	Vaillant 1888	45	830 – 2,330
Alepocephalus fundulus Garman	3,060	N 06° 17′ W 82° 05′	U. S. »Albatross» St. 3360	Garman 1899	1	2,324
Bathytroctes macrolepis Günther	3,934	N 02° 55′ E 124° 53′	»Challenger» St. 198	Günther 1887		
Bathytroctes dextrons Garman	3,311	N 06° 21′ W 80° 41′	U. S. »Albatross» St. 3382	Garman 1899	1	2,488
Rhamnetes nasutus (Koefoed)	3,886	N 20° 47′ W 80° 24′	»Atlantis» St. 2966	Parr 1952	1	2,865
Rouleina attritus (Vaillant)	3,650	N 15° 48′ W 20° 23′	»Talisman» St. CII	Vaillant 1888	7	1,615 – 2,150
Ericara salmonea Gill & Townsend	3,240		U. S. »Albatross» St. 3003	Gill & Townsend 1897		
Ericara salmonea Gill & Townsend (Syn. *Venezuathus profundorum* Gilbert)	2,470 – 3,993	N 33° 02′ 15″ W 120° 12′	U. S. »Albatross» St. 4390	Gilbert 1915		
Fam. Synodontidae						
Bathysaurus ferox Günther	3,120	N 15° 26′ W 25° 15′	»Michael Sars» St. 88	Koefoed 1927	10	1,800 – 2,615
Bathysaurus mollis Günther	3,431	N 34° 37′ E 140° 32′	»Challenger» St. 237	Günther 1887		
Bathysaurus mollis Günther	4,364	S 22° 21′ W 150° 17′	»Challenger» St. 281	Günther 1887		
Bathysaurus mollis Günther	3,665	N 15° 48′ W 20° 23′	»Talisman» St. CII	Vaillant 1888		
Bathysaurus mollis Günther	4,360	N 39° 50′ W 17° 57′ 15″	»Princesse Alice» St. 753	Vaillant in Roule 1919		
Bathysaurus mollis Günther	3,220		U. S. »Albatross» St. 5684	Townsend & Nichols 1925		
Bathysaurus mollis Günther	4,267 – 4,255	N 29° 48′ W 17° 39′	Sw. Deep-Sea Exp. St. 313	The present paper	1	2,615 – 2,865
Fam. Bathypteroidae						
Bathypterois longipes Günther	4,849	S 36° 44′ W 46° 16′	»Challenger» St. 325	Günther 1887		
Bathypterois longipes Günther	4,596	N 36° 05′ 30″ W 69° 51′45″	U. S. »Albatross» St. 2225	Goode & Bean 1895		
Bathypterois longipes Günther	4,020	N 38° 09′ W 23° 15′ 15″	»Princesse Alice» St. 527	Vaillant in Roule 1919		
Bathypterois longipes Günther	4,267 – 4,255	N 29° 48′ W 17° 39′	Sw. Deep-Sea Exp. St. 313	The present paper		
Bathypterois longipes Günther	5,610 – 5,600	N 09° 38′ W 26° 20′	Sw. Deep-Sea Exp. St. 329	The present paper		
Bathypterois longipes Günther	4,540 – 4,600	N 40° 33′ W 35° 24′	Sw. Deep-Sea Exp. St. 387	The present paper	73	826 – 1,747
Bathypterois longipes Günther	5,000 – 5,025	N 43° 40′ W 18° 45′	Sw. Deep-Sea Exp. St. 401	The present paper	1	2,615 – 2,865
Bathypterois longicauda Günther ap. inq.	4,666	S 39° 41′ W 131° 23′	»Challenger» St. 289	Günther 1887		
Benthosaurus grallator Goode & Bean	3,385	N 24° 33′ W 84° 23′	»Blake» St. 174	Goode & Bean 1895	1	2,812
Fam. Ipnopidae						
Bathypterops regis Hjort & Koefoed	abt. 5,000	N 28° 54′ W 24° 14′	»Michael Sars» St. 18	Hjort & Koefoed 1912		
Bathypterops regis Hjort & Koefoed	4,267 – 4,255	N 29° 48′ W 17° 39′	Sw. Deep-Sea Exp. St. 313	The present paper		
Bathypterops regis Hjort & Koefoed	5,250 – 5,300	N 01° 03′ W 18° 40′	Sw. Deep-Sea Exp. St. 342	The present paper		

Fam. Synaphobranchidae						
Synaphobranchus kaupi Johnson	3,200	N 16° 38′ W 18° 24′	»Talisman» St. C1	Vaillant 1888		
Synaphobranchus kaupi Johnson	3,465	N 31° 44′ 30″ W 42° 39′	»Princesse Alice» St. 2408	Zugmayer 1911	many	692 – 2,300
Synaphobranchus infernalis (Gill)	3,167	N 38° 30′ 30″ W 69° 08′ 25″	U. S. »Albatross» St. 2037	Gill 1883		
Synaphobranchus infernalis (Gill)	3,138	N 60° 17′ W 54° 05′	»Ingolf» St. 37	Lütken 1898		
Synaphobranchus infernalis (Gill)	3,120	N 45° 26′ W 25° 45′	»Michael Sars» St. 88	Koefoed 1927	2	2,615 – 2,865
Synaphobranchus bathybius Gunther	3,431	N 34° 37′ E 140° 32′	»Challenger» St. 237	Günther 1887		
Synaphobranchus bathybius Gunther	3,751	N 36° 10′ E 178° 00′	»Challenger» St. 246	Günther 1887		
Synaphobranchus bathybius Gunther	3,188	S 18° 06′ W 10° 05′	»Scotia» St. 451	Regan 1913	2	2,516 – 2,971
Fam. Halosauridae						
Halosaurupeza rostrata (Gunther)	5,032	N 35° 29′ W 50° 53′	»Challenger» St. 63	Günther 1887	?1	1,311
Halosaurupeza macrocheir (Gunther)	3,167	N 38° 53′ W 69° 23′ 30″	U. S. »Albatross» St. 2037	Goode & Bean 1895 (*H. gracilis*)		
Halosaurupeza macrocheir (Gunther)	3,120	N 45° 26′ W 25° 45′	»Michael Sars» St. 88	Koefoed 1927	35	1,100 – 2,995
Fam. Notacanthidae						
Polyacanthonotus challengeri (Vaillant)	3,431	N 34° 37′ E 140° 32′	»Challenger» St. 237	Günther 1887	1	2,973
Fam. Macrouridae						
Malacocephalus subarbitalis Gill & Townsend	3,240		U. S. »Albatross» St. 3603			
Lionurus filicauda (Gunther)	3,568	S 53° 55′ E 108° 35′	»Challenger» St. 157	Günther 1887		
Lionurus filicauda (Gunther)	3,294	S 50° 01′ E 123° 04′	»Challenger» St. 158	Günther 1887		
Lionurus filicauda (Gunther)	3,953	S 33° 31′ W 74° 43′	»Challenger» St. 299	Günther 1887		
Lionurus filicauda (Gunther)	3,477	S 35° 30′ W 50° 47′	»Challenger» St. 323	Günther 1887		
Lionurus filicauda (Gunther)	4,849	S 36° 44′ W 46° 16′	»Challenger» St. 325	Günther 1887		
Lionurus carapinus (Goode & Bean)	3,120	N 45° 26′ W 25° 45′	»Michael Sars» St. 88	Koefoed 1927	1	2,516
Lionurus carapinus caudopsoides n. sp.	4,267 – 4,295	N 29° 46′ W 17° 39′	5w. Deep Sea Exp. St. 313	The present paper	34	1,211 – 2,865
Lionurus carapinus caudopsoides n. sp.	4,872 – 4,867	N 22° 31′ W 23° 28′	5w. Deep Sea Exp. St. 319	The present paper		
Lionurus carapinus caudopsoides n. sp.	5,010 – 5,000	N 09° 38′ W 26° 20′	5w. Deep Sea Exp. St. 329	The present paper		
Lionurus carapinus caudopsoides n. sp.	5,250 – 5,300	N 01° 03′ W 18° 10′	5w. Deep Sea Exp. St. 342	The present paper		
Lionurus fragilis Garman	3,060	N 06° 17′ W 82° 05′	U. S. »Albatross» St. 3360	Garman 1899		
Lionurus fragilis Garman	3,336	N 02° 35′ W 83° 33′	U. S. »Albatross» St. 3374	Garman 1899		
Nezumia sclerorhynchus (Valenciennes)	3,200	N 16° 38′ W 18° 24′	»Talisman» St. C1	Vaillant 1888		
Nezumia sclerorhynchus (Valenciennes)	3,465	N 15° 48′ W 20° 23′	»Talisman» St. C11	Vaillant 1888	55	540 – 2,600
Coelorhynchus globiceps (Vaillant)	4,261	N 36° 55′ W 22° 22′ 45″	»Princesse Alice» St. 652	Roule 1919	9	1,139 – 2,995
Echinomacrurus mollis Roule	5,413	N 31° 07′ W 24° 03′	»Princesse Alice» St. 1787	Roule 1919		
Echinomacrurus mollis Roule	5,000 – 5,025	N 43° 40′ W 18° 45′	5w. Deep Sea Exp. St. 401	The present paper		
Gaussia flagellicauda (Koefoed)	3,120	N 45° 26′ W 25° 45′	»Michael Sars» St. 88	Koefoed 1927		
Macrourus berglax Lacépède	3,422	N 59° 12′ W 51° 05′	»Ingolf» St. 38	Lütken 1898	many	180
Nematonurus armatus (Hector)	3,568	S 53° 55′ E 108° 35′	»Challenger» St. 157	Günther 1887		
Nematonurus armatus (Hector)	3,294	S 50° 01′ E 123° 04′	»Challenger» St. 158	Günther 1887		
Nematonurus armatus (Hector)	3,751	N 36° 10′ E 178° 00′	»Challenger» St. 246	Günther 1887		

	Depth in m	Locality	Expedition	Author	Other records	
					Number	Depth in m
Nematonurus armatus (HECTOR)	4,437	S 00° 33′ W 151° 34′	»Challenger» St. 271	GÜNTHER 1887		
Nematonurus armatus (HECTOR)	3,477	S 35° 39′ W 50° 47′	»Challenger» St. 323	GÜNTHER 1887		
Nematonurus armatus (HECTOR)	4,165	N 43° 15′ W 19° 20′	»Talisman» St. CXXXV	VAILLANT 1888		
Nematonurus armatus (HECTOR)	4,255	N 44° 20′ W 17° 11′	»Talisman» St. CXXXVI	VAILLANT 1888		
Nematonurus armatus (HECTOR)	3,138	N 60° 17′ W 54° 05′	»Ingolf» St. 37	LÜTKEN 1898		
Nematonurus armatus (HECTOR)	3,610	N 34° 38′ 30″ W 08° 41′	»Princesse-Alice» St. 436	ROULE 1919		
Nematonurus armatus (HECTOR)	4,020	N 38° 09′ W 23° 15′ 45″	»Princesse-Alice» St. 527	ROULE 1919		
Nematonurus armatus (HECTOR)	3,020	N 38° 39′ W 25° 06′ 15″	»Princesse-Alice» St. 1322	ROULE 1919		
Nematonurus armatus (HECTOR)	4,700	N 45° 26′ W 09° 20′	»Michael Sars» St. 10	KOEFOED 1927		
Nematonurus armatus (HECTOR)	3,120	N 45° 26′ W 25° 45′	»Michael Sars» St. 88	KOEFOED 1927		
Nematonurus armatus (HECTOR)	3,705	N 39° 50′ W 66° 50′	»Atlantis»	SCHROEDER 1940		
Nematonurus armatus (HECTOR)	4,267—4,255	N 29° 48′ W 17° 39′	Sw. Deep-Sea Exp. St. 313	The present paper		
Nematonurus armatus (HECTOR)	4,540—4,600	N 40° 33′ W 35° 24′	Sw. Deep-Sea Exp. St. 387	The present paper	18	281—2,942
Nematonurus abyssorum GILBERT	2,470—3,993	N 33° 02′ 15″ W 120° 42′	U. S. »Albatross» St. 4390	GILBERT 1915		
Nematonurus lecointei (DOLLO)	3,248	S 62° 10′ W 41° 20′	»Scotia» St. 313	REGAN 1913		
Nematonurus lecointei (DOLLO)	3,188	S 48° 06′ W 10° 05′	»Scotia» St. 451	REGAN 1913	1	2,792
Chalinura simula GOODE & BEAN	3,167	N 38° 53′ W 69° 23′ 30″	U. S. »Albatross» St. 2037	GOODE & BEAN 1895		
Chalinura simula GOODE & BEAN	3,235	N 40° 29′ W 66° 04′	U. S. »Albatross» St. 2572	The present paper		
Chalinura simula GOODE & BEAN	3,120	N 45° 26′ W 25° 45′	»Michael Sars» St. 88	KOEFOED 1927		
Chalinura simula GOODE & BEAN	3,705	N 39° 50′ W 66° 50′	»Atlantis»	SCHROEDER 1940		
Chalinura simula GOODE & BEAN	4,540—4,600	N 40° 33′ W 35° 24′	Sw. Deep-Sea Exp. St. 387	The present paper	8	609—2,865
Chalinura profundicola n. sp.	4,267—4,255	N 29° 48′ W 17° 39′	Sw. Deep-Sea Exp. St. 313	The present paper		
Chalinura profundicola n. sp.	4,872—4,867	N 22° 31′ W 23° 28′	Sw. Deep-Sea Exp. St. 319	The present paper		
Chalinura profundicola n. sp.	4,700	N 45° 26′ W 09° 20′	»Michael Sars» St. 10	KOEFOED 1927; the present paper		
Chalinura brevibarbis GOODE & BEAN	3,167	N 38° 53′ W 69° 23′ 30″	U. S. »Albatross» St. 2037	GOODE & BEAN 1895		
Chalinura brevibarbis GOODE & BEAN	3,120	N 45° 26′ W 25° 45′	»Michael Sars» St. 88	KOEFOED 1927	9	1,569—2,492
Chalinura liocephala (GÜNTHER)	3,431	N 34° 37′ E 140° 32′	»Challenger» St. 237	GÜNTHER 1887		
Chalinura liocephala (GÜNTHER)	3,751	N 36° 10′ E 178° 00′	»Challenger» St. 246	GÜNTHER 1887		
Coryphaenoides altipinnis (GÜNTHER)	3,431	N 34° 37′ E 140° 32′	»Challenger» St. 237	GÜNTHER 1887	1	1,034
Fam. Zoarcidae						
Pachycara obesa ZUGMAYER	4,780	N 45° 27′ W 06° 05′	»Princesse-Alice» St. 1554	ZUGMAYER 1911		
Fam. Lycodidae						
Lycenchelys albus (VAILLANT)	3,975		»Talisman» St. CXXXIII	VAILLANT 1888		
Lycenchelys antarcticus REGAN	3,248	S 62° 10′ W 41° 20′	»Scotia» St. 313	REGAN 1913		

Parabassogigas grandis (Günther)	3,431	N 34° 37′ E 140° 32′	»Challenger» St. 237	Günther 1887		
Parabassogigas crassus (Vaillant)	4,255	N 44° 20′ W 17° 11′	»Talisman» St. CXXXVI	Vaillant 1888		
Parabassogigas crassus (Vaillant)	3,120	N 45° 26′ W 25° 45′	»Michael Sars» St. 88	Koefoed 1927	3	1,797—2,300
Bassogigas pterotus (Alcock)	3,198	N 11° 58′ E 88° 52′ 17″	»Investigator» St. 117	Alcock 1891	2	1,830—2,397
Bassogigas brucei (Dollo)	4,575	S 67° 33′ W 36° 35′	»Scotia» St. 291	Dollo 1906		
Bassogigas digittatus (Garman)	3,336	N 02° 35′ W 83° 53′	U. S. »Albatross» St. 3374	Garman 1899		
Bassogigas digittatus (Garman)	4,084	N 10° 14′ W 96° 28′	U. S. »Albatross» St. 3414	Garman 1899		
Bassogigas digittatus (Garman)	3,438	N 14° 46′ W 98° 40′	U. S. »Albatross» St. 3415	Garman 1899	2	2,197—2,906
Bassogigas squamosus (Roule)	4,261	N 36° 55′ W 22° 22′ 45″	»Princesse-Alice» St. 652	Roule 1916	1	2,603
Bassogigas profundissimus (Roule)	6,035	N 12° 07′ 30″ W 35° 53′	»Princesse-Alice» St. 1173	Roule 1913		
Bassogigas profundissimus (Roule)	5,610—5,600	N 09° 38′ W 26° 20′	Sw. Deep-Sea Exp. St. 329	The present paper		
Bassogigas profundissimus (Roule)	5,850—5,860	N 24° 12′ W 63° 23′	Sw. Deep-Sea Exp. St. 371	The present paper		
Alcockia rostrata (Günther)	3,934	N 02° 55′ E 124° 53′	»Challenger» St. 198	Günther 1887		
Bassozetus normalis Gill	3,513	N 24° 33′ W 84° 23′		Goode & Bean 1895	3	1,969—2,845
Bassozetus taenia (Günther)	4,575	N 02° 25′ W 20° 01′	»Challenger» St. 104	Günther 1887		
Bassozetus taenia (Günther)	5,610—5,600	N 09° 38′ W 26° 20′	Sw. Deep-Sea Exp. St. 329	The present paper		
Bassozetus taenia (Günther)	5,044—5,033	N 12° 22′ W 52° 00′	Sw. Deep-Sea Exp. St. 363	The present paper		
Bassozetus oncerocephalus (Vaillant)	3,200	N 16° 38′ W 18° 24′	»Talisman» St. CI	Vaillant 1888		
Bassozetus nasus Garman	3,438	N 14° 46′ W 98° 40′	U. S. »Albatross» St. 3415	Garman 1899		
Bassozetus nasus Garman	3,242	N 04° 56′ W 80° 52′ 30″	U. S. »Albatross» St. 3381	Garman 1899		
Bassozetus nasus Garman	3,059	N 06° 17′ W 82° 05′	U. S. »Albatross» St. 3360	Garman 1899		
Porogadus melanocephalus (Alcock)	3,008	N 12° 50′ E 90° 52′	»Investigator» St. 111	Alcock 1891		
Porogadus melanocephalus (Alcock)	3,198	N 11° 58′ E 88° 52′ 17″	»Investigator» St. 117	Alcock 1891		
Porogadus subarmatus Vaillant	3,200	N 16° 38′ W 18° 24′	»Talisman» St. CI	Vaillant 1888		
Porogadus longiceps Garman	3,242	N 04° 56′ W 80° 52′ 30″	U. S. »Albatross» St. 3381	Garman 1899		
Porogadus longiceps Garman	3,281	N 06° 21′ W 80° 41′	U. S. »Albatross» St. 3382	Garman 1899	2	245—1,866
Porogadus abyssalis n. sp.	5,250—5,300	N 01° 03′ W 18° 40′	Sw. Deep-Sea Exp. St. 342	The present paper		
Mixonus laticeps (Günther)	4,575	N 02° 25′ W 20° 01′	»Challenger» St. 104	Günther 1878		
Mixonus laticeps (Günther)	3,200	N 16° 38′ W 18° 24′	»Talisman» St. CI	Vaillant 1888		
Mixonus (?)*laticeps* (Günther)	4,267—4,255	N 29° 48′ W 17° 39′	Sw. Deep-Sea Exp. St. 313	The present paper	1	2,615
Leucicorus lusciosus Garman	3,438	N 14° 46′ W 98° 40′	U. S. »Albatross» St. 3415	Garman 1899		
Acanthonus spinifer Garman	3,242	N 04° 56′ W 80° 52′ 30″	U. S. »Albatross» St. 3381	Garman 1899		
Typhlonus nasus Günther	4,465	S 13° 50′ E 151° 49′	»Challenger» St. 181	Günther 1887		
Typhlonus nasus Günther	3,934	N 02° 55′ E 124° 53′	»Challenger» St. 198	Günther 1887		
Sciadonus kullenbergi n. sp.	4,540—4,600	N 40° 33′ W 35° 24′	Sw. Deep-Sea Exp. St. 387	The present paper		
Leucochlamys cryptophthalmus Zugmayer	5,000	N 44° 08′ W 10° 44′	»Princesse-Alice» St. 2994	Zugmayer 1911		
Leucochlamys jonassoni n. sp.	5,610—5,600	N 09° 38′ W 26° 20′	Sw. Deep-Sea Exp. St. 329	The present paper		
Fam. Liparidae						
Careproctus longifilis Garman	3,336	N 02° 35′ W 83° 53′	U. S. »Albatross» St. 3374	Garman 1899		
Paraliparis fimbriatus Garman	3,242	N 04° 56′ W 80° 52′ 30″	U. S. »Albatross» St. 3381	Garman 1899		
Paraliparis latifrons Garman	3,281	N 06° 21′ W 80° 41′	U. S. »Albatross» St. 3382	Garman 1899		

PLATES

PLATE I

Fig. 1. *Bathypterois longipes* GÜNTHER. The two specimens from St. 401. Abt. $\frac{3}{8}$ nat. size. Photo of the freshly captured specimens by J. ERIKSSON.

Fig. 2. *Echinomacrurus mollis* ROULE. The two specimens from St. 401. Somewhat less than $\frac{1}{2}$ nat. size. Photo of the freshly captured specimens by J. ERIKSSON.

Fig. 3. *Bathysaurus mollis* GÜNTHER from St. 313. Abt. $\frac{3}{4}$ nat. size. Photo of the preserved specimen by V. FONTAINE.

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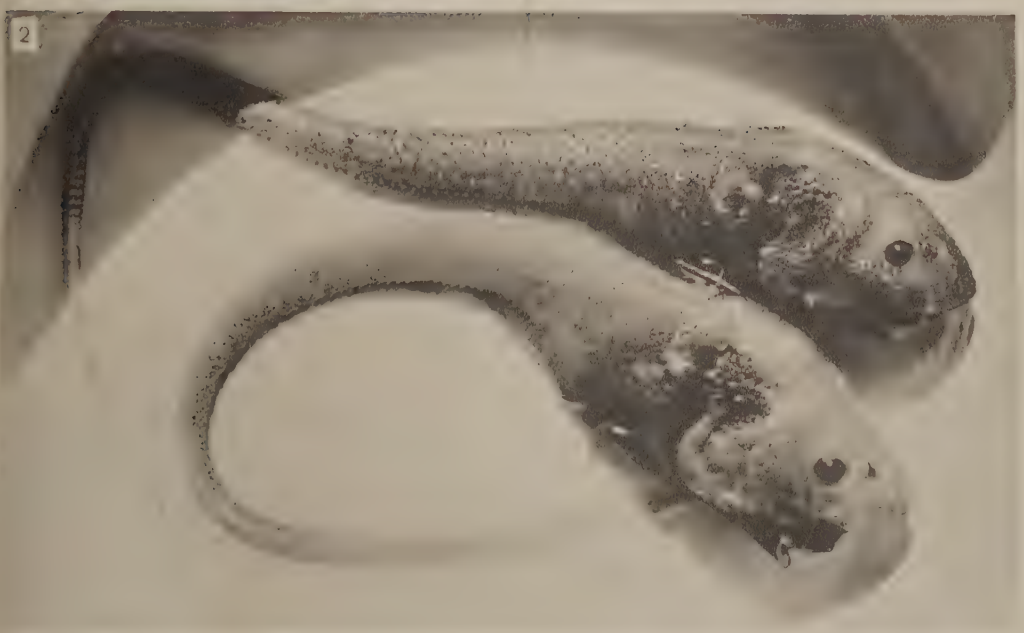
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PLATE II

Chalinura profundicola n. sp. from St. 319.

Fig. 1 a. Type specimen viewed from the right, b. the largest specimen viewed from the left. Abt. $\frac{1}{4}$ nat. size. Photo of the freshly captured specimens by J. Eriksson.

Fig. 2. Type specimen, head viewed from above. Abt. $\frac{1}{2}$ nat. size.

Fig. 3. Type specimen, head and body viewed from the left. Abt. $\frac{1}{2}$ nat. size.

Fig. 4. Largest specimen, head and body viewed from the left. Abt. $\frac{1}{2}$ nat. size.

Fig. 5. Largest specimen, head viewed from above. Abt. $\frac{1}{2}$ nat. size.

Figs. 2—5 photos of the preserved specimens by V. Fontaine.

a

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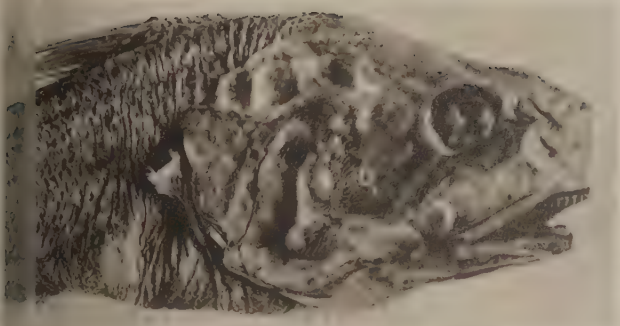
PLATE III

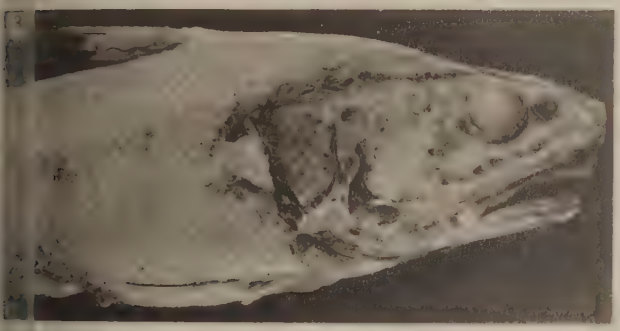
Figs. 1—2. *Chalinura brevibarbis* Goode & Bean. Specimen taken by the U. S. »Albatross», N 41° 53′, W 65° 35′ Sept. 2. 1883, now in the Nat. Hist. Museum, Göteborg. 1. Head and body viewed from the right. 2. Head and body viewed from above. $\frac{4}{5}$ nat. size.

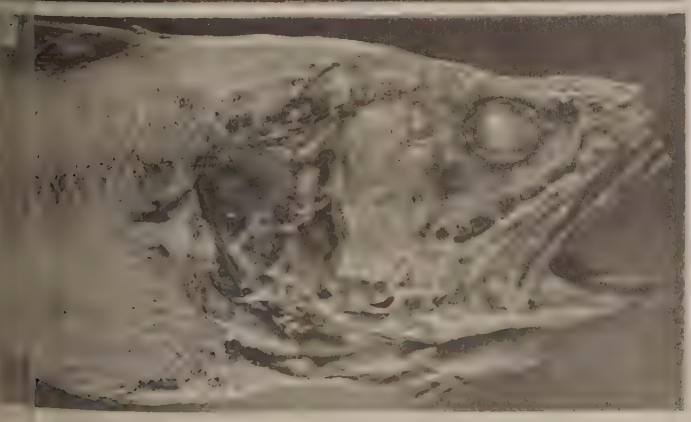
Figs. 3—4. *Ch. simula* Goode & Bean from St. 387. 3. Head and body viewed from the right. 4. Head and body viewed from above. $\frac{4}{5}$ nat. size.

Figs. 5—6. *Ch. profundicola* n. sp. from St. 313, next smallest specimen. 5. Head and body viewed from the right. 6. Head and body viewed from above. $\frac{4}{5}$ nat. size.

Figs. 7—8. *Ch. profundicola* n. sp. from St. 313, largest specimen. 7. Head and body viewed from the right. 8. Head and body viewed from above. $\frac{2}{3}$ nat. size. All figures photos of the preserved specimens by V. Fontaine.







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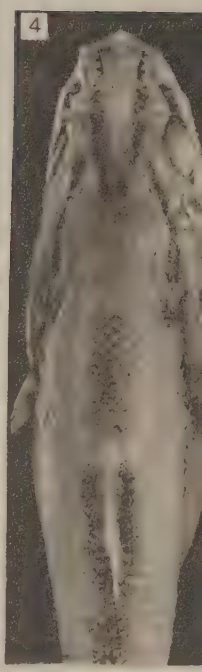

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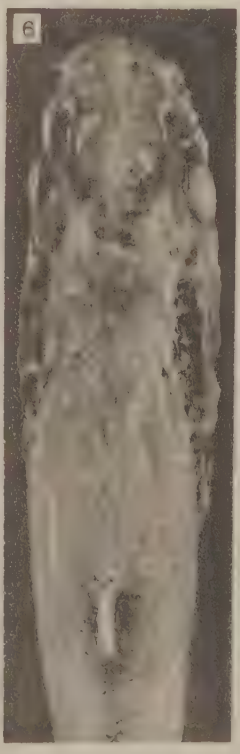

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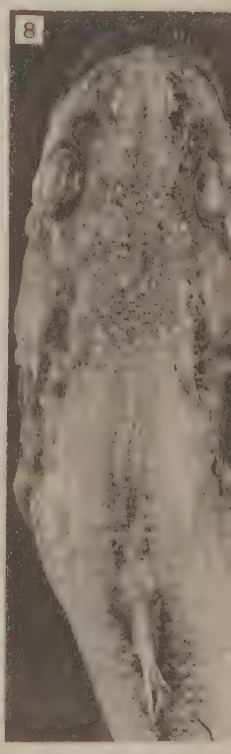


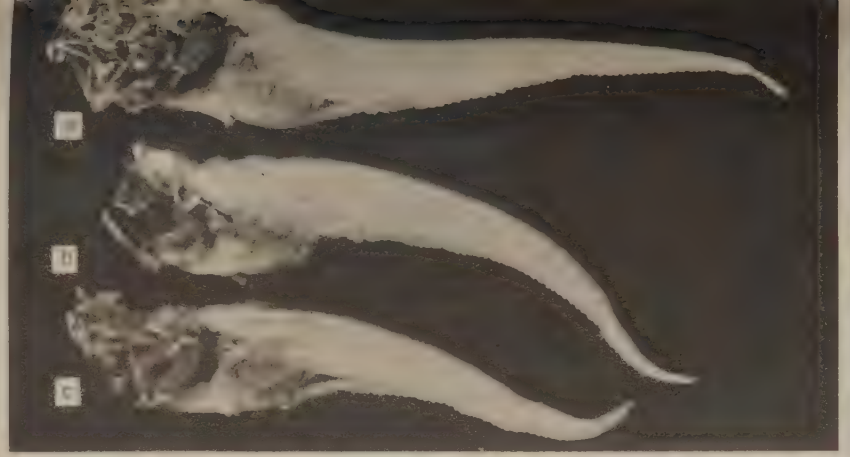
PLATE IV

Fig. 1. *Lionurus carapinus euabyssalis* n. subsp. a. from St. 303, b. and c. the two largest specimens from St. 329. Nat. size.

Fig. 2. *Lionurus carapinus euabyssalis* n. subsp. The five smallest specimens from St. 329. Note the pigmentation of the body. Nat. size.

Figs. 3—4. *Lionurus carapinus euabyssalis* n. subsp. from St. 342. Type specimen. 3. Head and body viewed from the left. 4. Head and body viewed from above. Nat. size. Figs. 1—4 photos of the preserved specimens by V. FONTAINE.

Fig. 5. *Nematonurus armatus* (HECTOR) from St. 387. Photo of the freshly captured specimen by J. ERIKSSON.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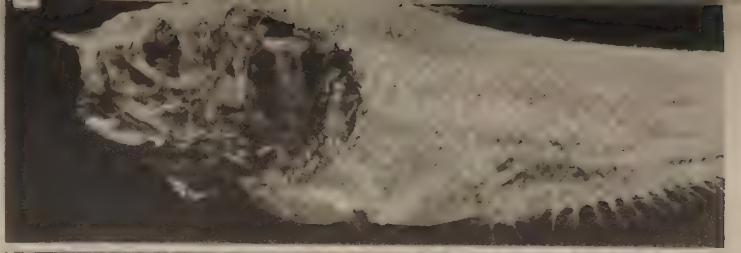

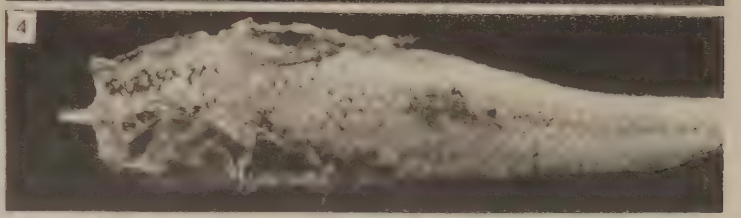
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PLATE V

Fig. 1. *Barathrites parri* n. sp. [= *B. iris* Zugmayer by Parr (1937)] viewed from the left, the head somewhat bent to the right. Abt. $\frac{3}{4}$ nat. size.

Fig. 2. *B. iris* Zugmayer from St. 363, viewed from the left. $\frac{9}{10}$ nat. size.

Fig. 3. *Mixonus* (?)*laticeps* (Günther) from St. 313, viewed from the right. $\frac{4}{5}$ nat. size.

Fig. 4. *Bassogigas profundissimus* (Roule), female, from St. 329, viewed from the right. $\frac{4}{5}$ nat. size.

Fig. 5. *Lamprogrammus niger* Alcock from St. 41: II, viewed from the right, the head somewhat bent to the left. $\frac{3}{4}$ nat. size.

All figures photos of the preserved specimens by V. Fontaine.

PLATE VI

Fig. 1. *Bassozetus taenia* (GÜNTHER) from St. 363, viewed from the right. Abt. $\frac{3}{4}$ nat. size.

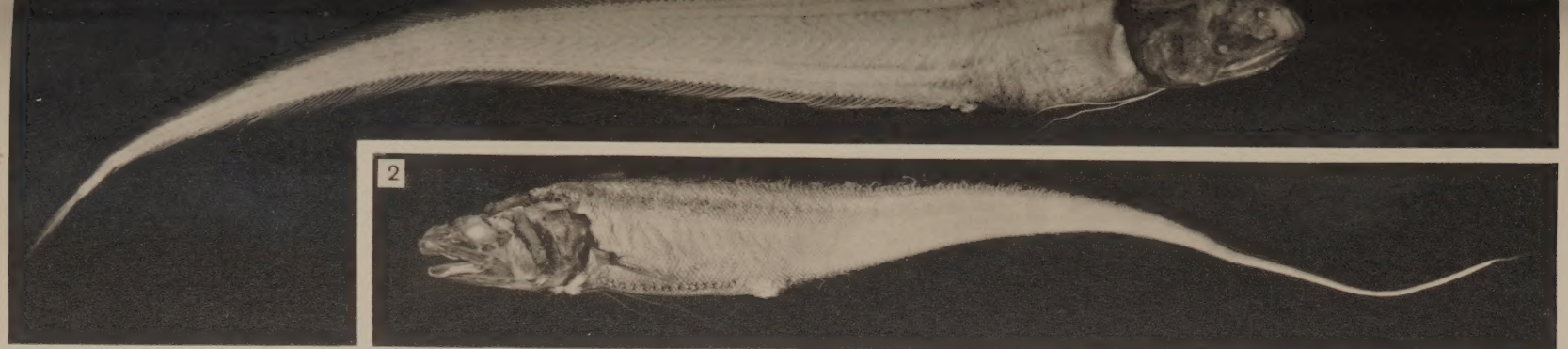
Fig. 2. *Porogadus abyssalis* n. sp. from St. 342, viewed from the left. $\frac{4}{5}$ nat. size.

Figs. 3—4. *P. abyssalis* n. sp., same specimen. 3. Head viewed from the left. 4. Head viewed from above. × 2.

Figs. 5—6. *P. gracilis* (GÜNTHER). Type specimen. 5. Head viewed from the left. 6. Head viewed from above. × 2.

Fig. 7. *P. subarmatus* VAILLANT. Specimen taken by the »Talisman» Expedition St. CI now in the Nat. Hist. Museum, Göteborg. Head viewed from the left. × 2

Figs. 1—4 and 7 photos of the preserved specimens by V. FONTAINE, figs 5—6 British Museum (Nat. Hist.) photo.



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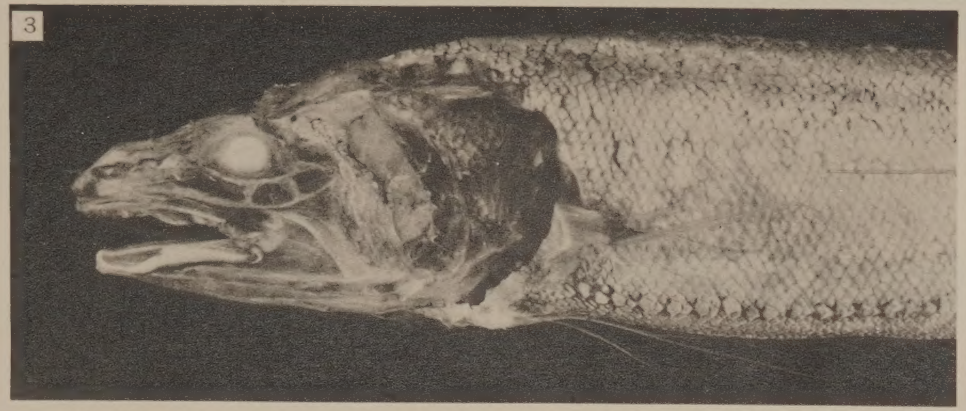

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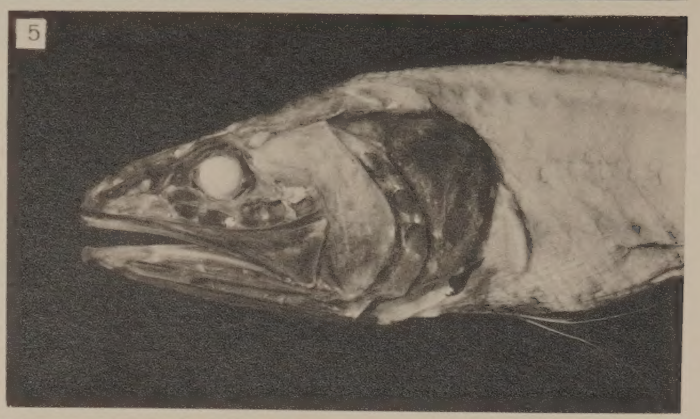

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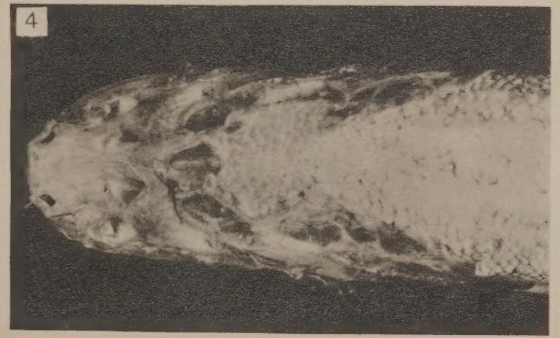

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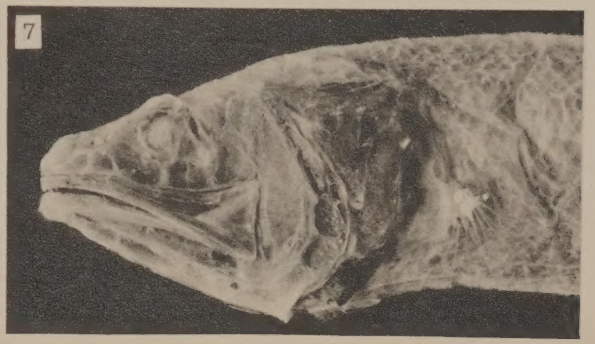
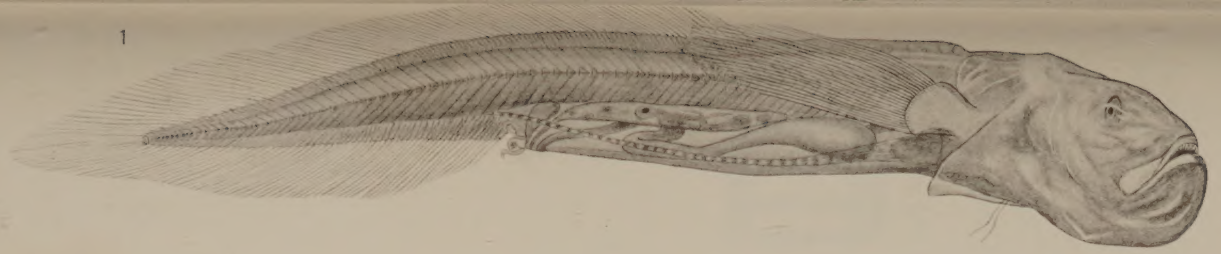


PLATE VII

Fig. 1. *Barathronus erikssoni* n. sp., female, from St. 342, viewed from the right. × 2.
Fig. 2. *Sciadonus kullenbergi* n. sp., female, from St. 387, viewed from the right. × 2.
Fig. 3. *Leucochlamys jonassoni* n. sp., female, from St. 329, viewed from the right. × 2.
Fig. 4. Gen.et sp. indet. from St. 387, viewed from the right. × 2.
Fig. 5. *Barathronus erikssoni* n. sp. Head viewed from above. × 3.
Fig. 6. *Sciadonus kullenbergi* n. sp. Head viewed from above. × 3.
Fig. 7. *Barathronus erikssoni* n. sp. Anal and urogenital openings viewed from the right (a) and from below (b). × 5.
Fig. 8. *Sciadonus kullenbergi* n. sp. Anal and urogenital openings viewed from the right (a) and from below (b). × 5.
Fig. 9. *Leucochlamys jonassoni* n. sp. Anal and urogenital openings viewed from the right (a) and from below (b). × 10.
Fig. 10. *L. cryptophthalmus* ZUGMAYER. Anal and urogenital openings viewed from the right (a) and from below (b). After pencil sketches made by the present author at Monaco from the type specimen. × abt. 4
Fig. 11. Gen. et sp. indet. Anal and urogenital openings viewed from the right (a) and from below (b). × 10.
All figures made by MISS U. BRAUNS.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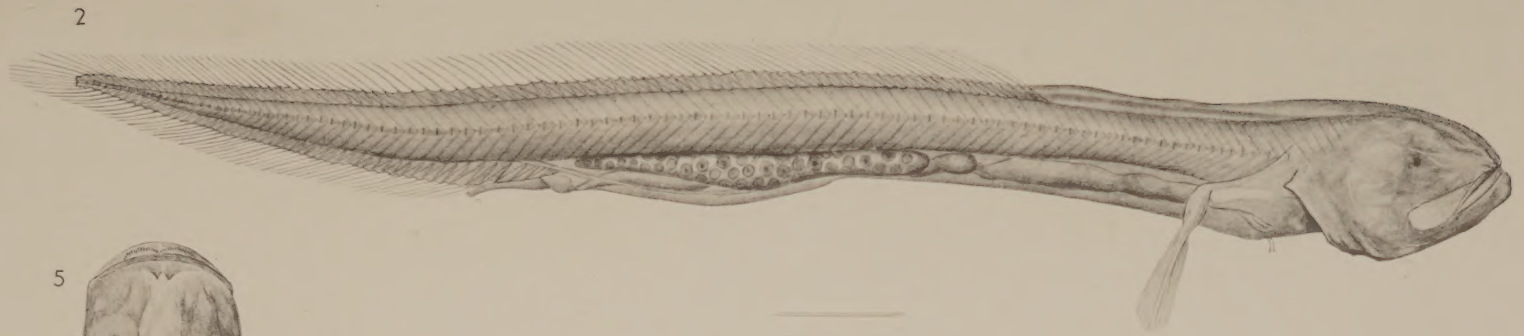
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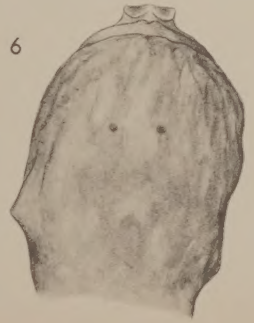
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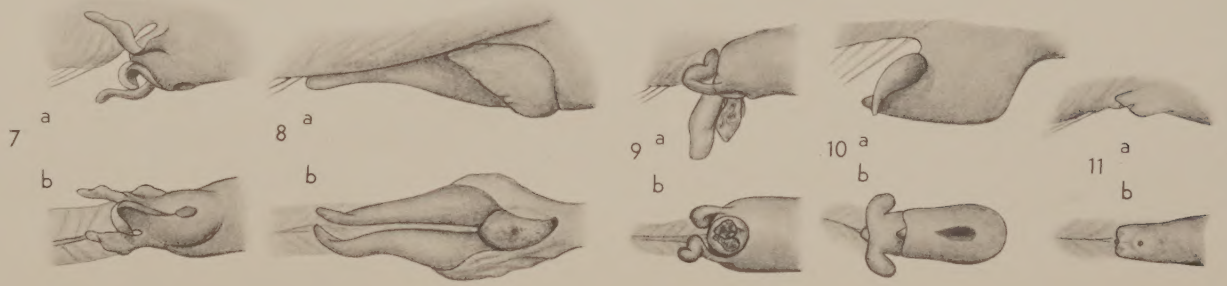
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